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Electrical World

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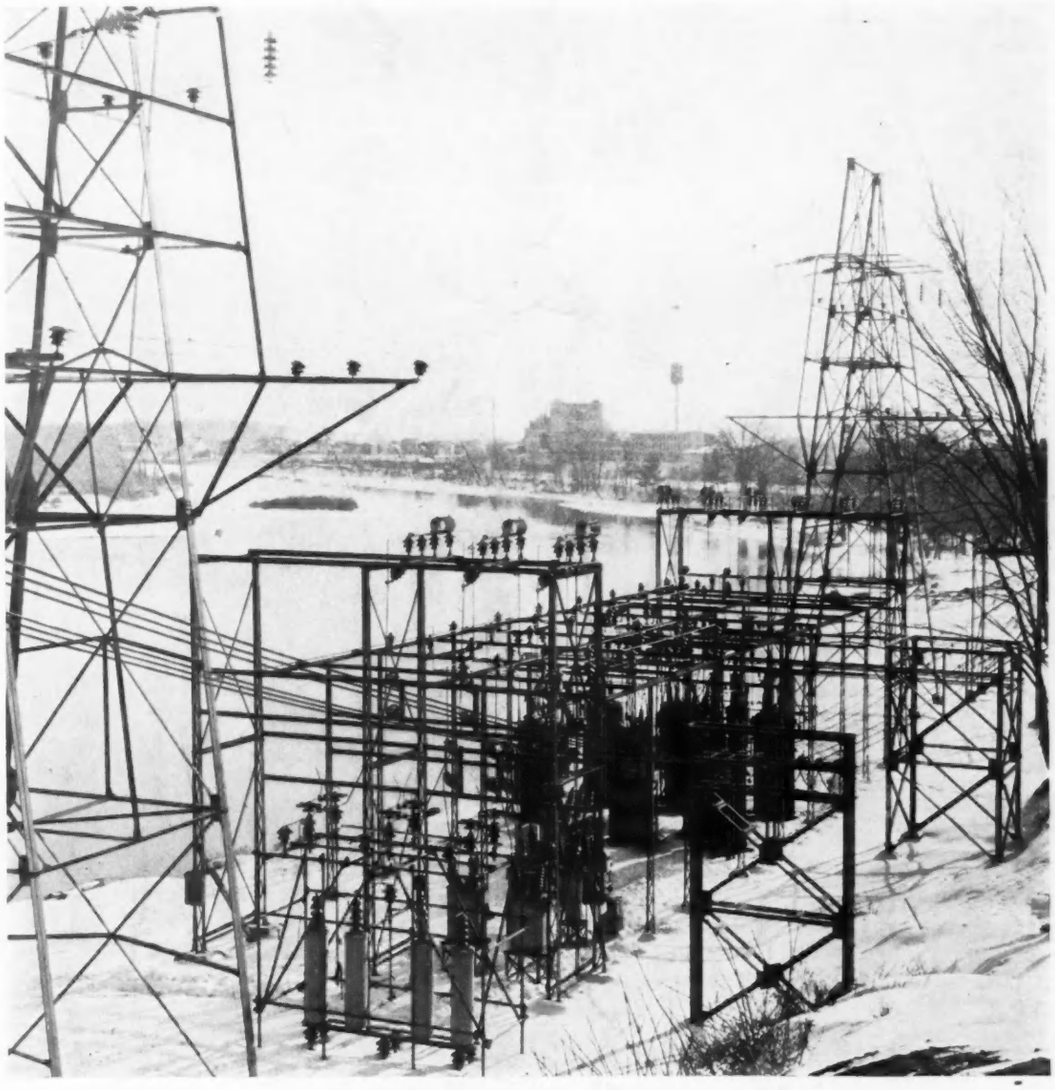

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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The Price of the Heart

MORE money is paid out for the labor of men and women than for anything else in the world. Nature bestows freely upon mankind the products of the mines, the fields, the forest and the waters. Labor turns these raw materials into manufactured articles at a price that is, after all, just the sum total of the cost of the combined work that men have put upon them from their crude state to perfection.

Labor, therefore, is the greatest of all commodities. To all men it is the most important purchase and the most important sale. Yet it is bought and sold carelessly, with the most casual consideration and the most wasteful inefficiency. For labor is commonly paid for by the measure of time—so much an hour, a day, a week, a month, a year, according to the nature of the task. Could there be a more absurd, unthinking way to reckon the value of the work that men and women perform?

The true worth of work is not a matter of either hours or the task. Rather it is the quality of the service rendered that sets the value. Three elements there are that enter into each man's work—the hands, the head, the heart. From one you buy the labor of the hands only. From another you purchase again the labor of the hands, but this worker contributes something more. He puts his mind into his work—he sells the service of his brain as well—and to men like this employers gladly pay a higher price. These are the foremen, the department heads—these thinkers—and their time is worth much more than that of those who labor only with their hands. But when an employee who supports his hands with thinking also puts his heart into his work, then have we found the greatest value in the labor market.

A man's hands may be hired for money. A man's thinking may be bought for money, too, if he will sell it. But a man's heart he never sells for coin. It must be won from him by leadership, by inspiration, by human sympathy, by heart appeal to confidence, respect, enthusiasm, hope and loyalty.

Time clocks record the hours. Rules and systems guide and apply the thinking of those who are willing to sell their minds also. But there is no machinery to win men's hearts. This element in human service, worth more than all the rest, is only given in exchange to the employer who himself puts his own heart into the service of his employees.

Herbert William Young

An engineer who is a pioneer in outdoor installations, a leader in the movement for standardized equipment and a manufacturer who makes service the keystone of his business.

THE most wonderful thing about the electrical industry is the opportunity it offers a man with brains and vision. It has never run in a rut or stifled individual initiative because it grows so rapidly and its applications are so innumerable. Example after example may be cited to show how individuals have succeeded by developing an opportunity for giving a needed service whose possibilities they grasped in its infancy.

Such a man is H. W. Young, president of the Delta-Star Electric Company, who foresaw the trend toward outdoor installations and immediately set out against all opposition to prepare the equipment that would be needed. He worked consistently for the development of outdoor installations and equipment and in the early days of his business was forced to be at once inventor, designer, builder and salesman.

Born in 1875, Mr. Young started in life in the shops of the General Electric Company, later became assistant foreman in the meter department and then transferred to the engineering department, where as an assistant to the late C. D. Haskins he wrote the first handbook on meters. Later he was sales manager of the New England district for the Westinghouse Electric & Manufacturing Company and then spent two years as sales manager of the Central Electric Company.

Becoming convinced of the value of outdoor equipment, he incorporated the Delta-Star Electric Company in 1908 and developed high-voltage outdoor switching and protective equipment. He has several patents on air-break switches to his credit and has preached the gospel of standardization and service throughout his business career. One of his hobbies is giving engineering as well as manufacturing service to purchasers of outdoor station equipment.

Mr. Young is a member of the Union League Club of Chicago, the South Shore Club, the Evanston Golf Club and the Electric Clubs of Chicago and Los Angeles. He has served on N. E. L. A. committees, being at the present time chairman of the sub-committee on substations and transmission towers, and is a member of the A. I. E. E. His genial personality and constructive optimism have gained him a host of friends in the industry who take pride in his standing as engineer, electrical manufacturer and man.

Editorial Comment

Electrical World, December 22, 1923

Volume 82 Number 25

Saving Millions to Public by Rate Reductions

IF ANY testimony were needed of the value and efficacy of commission regulation, it is provided in the great savings that have been made by the public through rate reductions. Of course, there could be no reductions if the electric light and power companies were not zealous and conscientious in the discharge of their duties. Were they indifferent to the problems of the day, did they not seek to offset higher costs by increased efficiency and the installation of better equipment, rates would be higher than they are at present. The electric light and power companies and not the commissions make rate reductions possible; but freedom from competition is a great asset, and that is what the commissions now give public utilities. Commissions also safeguard the interest of the public, because as soon as the utilities earn more than a reasonable return on their investment rate reductions are ordered. Thus the two work side by side, the one laboring diligently and assiduously in providing a service at minimum cost, and the other seeing that the job is not interfered with. So it comes that many companies received awards of merit during the year, not in the shape of gold medals or engraved diplomas, it is true, but by a far better recognition of work well done—an order to reduce rates. The inhabitants of Philadelphia were spared one million dollars by that means this year and a million and a quarter a year ago. Residents of southern California likewise saved two and a half millions, and so the march of progress continues. Consumers save millions of dollars annually and the service grows better and better. Surely such a record is commendable.

Economy and Waste in Buying Habits

BEFORE the war a salesman was accustomed to having customers purchase on a yearly basis. His order book was usually filled with a few big orders. In contrast, the present habit of customers appears to be to purchase on a small-lot basis, and the order book becomes filled with many small orders. There is no doubt that this latter method of buying is causing real waste. It detracts from the efficient operation of industry, because economies in production are usually obtained by planning ahead on a known or fairly definite basis, and economies in distribution by dealing with large unit orders. Manufacturing organizations cannot purchase raw materials with confidence; they instead of the purchaser must carry the surplus supplies and manufactured products; the load factor on the plant is very poor, and the overhead, sales charges and administrative charges increase.

On his part, the consumer feels that economic conditions change so rapidly that business judgment dictates the purchase of a minimum amount of material and the depletion of inventory stock. Labor, materials and interest rates fluctuate rapidly and prevent planning with confidence for future developments, and the consumer always either hopes or fears that the general price level will drop.

This general situation is reflected in the electrical industry in many lines. It is serious enough to receive the thoughtful consideration of the leaders in the industry. If the present practice is indeed as uneconomical as it appears from a general analysis, co-operative steps should be taken to reach a solution even though this should involve participation in the councils of other industries.

Free Trade in the Sale of Electrical Appliances

THE futility of attempting to prevent or limit the sale of electrical appliances by non-electric dealers is clearly defined by conditions which are coming to light in the ELECTRICAL WORLD survey of retail outlets for electrical merchandise. In the first article, published Dec. 8, the opinion of the vice-president and general manager of the central-station company is most significant. Criticising the attitude of those who believe that manufacturers and jobbers should refuse to sell to drug and department stores, he said: "Such a policy tends to cause those stores to sell cheap, inferior products, which gives the business a bad name and, in general, demoralizes efforts to insure a high standard of the appliances being sold. The central-station company should not attempt to corner the appliance situation, but should pursue an aggressive policy in order to stimulate other merchants to greater activity. . . . If the policy of free trade is adopted, the question of inferior appliances will soon take care of itself."

Contrast with the foregoing a statement in this week's article, on page 1270, by a dealer who advocates boycotting of all jobbers and manufacturers who sell to department stores. Almost in the same breath this dealer declares that department store competition is not being felt. "Consistency, thou art a jewel." The survey, however, shows that two department stores in that city are selling 25 per cent of the electrical appliances and report their business as increasing rapidly.

Two very evident conclusions may be drawn from the opinions of these men in two different cities. First, stumbling blocks placed in the way of the non-electrical store handling "quality" merchandise only encourage the greater sale of inferior appliances, and when standard lines are obtained it is more than likely they will be offered at cut prices as leaders or for pure vindictiveness. Second, the fact that two department stores, with a comparatively recent start, are doing

one-quarter of the appliance business in a city of 200,000 indicates public acceptance and approval of that class of store as an electrical merchandiser. Shoppers will go where they are best served, and if the straight electrical dealer sees his business slipping away from him, he will do well to look for flaws in his own sales policy before trying to put his competitor out in the cold by coercing the manufacturer or jobber.

The Economic Urges to Higher Illumination Intensities

IT CANNOT be denied that tremendous progress has been made in raising the standards of lighting in the last decade; however, it is equally obvious that the average illumination is still far below what is now economically desirable. Any one giving the slightest serious thought to lighting must admit that it is next in importance to food and shelter, because it is essential to vision and therefore to safety and production and to human progress in general. The greatest inhibition to advancement in lighting is perhaps indifference. Human beings have always had light. There is nothing strikingly novel in lighting. It is a prosaic matter as old as time. This indifference is difficult to overcome even with the wonderful new possibilities of modern light sources. However, dollars always speak loudly and they are listened to with attention and reverence. Dollars are beginning to speak eloquently for higher standards of lighting.

The effect of intensity of illumination on speed of vision, reaction time, production and so forth has been studied both in the laboratory and in the factory. Although much remains to be done, the results of a number of investigations are so strikingly similar that there is no doubt that there is a real economic advantage in increasing present average levels. M. Luckiesh and his colleagues have shown that the speed of reading of black print on white paper automatically increases 20 per cent on increasing the intensity of illumination from 2 foot-candles to 8 foot-candles. When the contrast is reduced, as with black type on gray paper, the increase in speed of reading was found to be about 60 per cent for the same increase in illumination as in the previous case. These data apply without reservation to the very general process of reading, and it is not unsafe to interpret from them a real advantage from increasing the intensity of illumination in any visual process.

More recently Dr. P. W. Cobb has reported results of an elaborate investigation of reaction times for various visual test objects. The speed of recognition of black and white lines out of a clear field and also when the object was preceded and followed by confusion patterns (analogous to reading or other continuous visual processes) increased with each increase in illumination throughout a range of intensities from 1 foot-candle to 100 foot candles—the limit of his investigations so far. Dr. Cobb's researches may result in eventually classifying visual conditions, thereby aiding in appraising the probable increase in industrial production attainable by proposed improved lighting.

Experiments conducted in factories also point in the same direction, although the laboratory work is necessary for complete analysis. D. P. Hess and Ward Harrison have recently reported the results obtained in the inspection department of a factory. They found an increase in production of 12.5 per cent on increasing the intensity of illumination from 5 foot-candles to 20 foot-candles. From the viewpoint of cost, this 12.5 per cent increase in the output of the forty-four employees involved was obtained by an increase in lighting cost equivalent to only 2.5 per cent of the payroll of the employees. These values are in line with those obtained a few years ago by W. A. Durgin. Incidentally, in a factory recently, an increase of 10 per cent in production in the daytime resulted from cleaning the windows. In one year this increase was equivalent to twenty-eight times the cost of cleaning the windows, which were quite dirty, as many factory windows are.

All these investigations point to a substantial economic advantage in higher-intensity lighting, and along with this advantage come the benefits of greater safety, less spoilage and more cheerful surroundings. Money talks, and in this case loudly, for, if the illumination intensity of the factories of this country were increased two or three times, the value of the increased output would easily far exceed the entire cost of electrical energy consumed in lighting. In other words, by such a simple expedient we should obtain better and safer working conditions and light the entire country at no net cost. This is a great opportunity and should be the goal of the electric lighting industry. Some day it may be proudly said that the electrical industry is lighting this great country at a net cost of nothing.

Maine Should Export Surplus Power

IN A RECENT address at Bangor, reported briefly in the ELECTRICAL WORLD for Dec. 1, Clarence G. Stetson sounded a note of warning to the people of Maine which contains much food for thought. For many years, as is well known, the exportation of hydroelectric energy from that state has been forbidden by law. Potential power resources, to be sure, considerably exceed the market in sight for energy, but politicians stress the idea that if Maine withholds water power from interstate transmission, industries will come into the Pine Tree State and greatly increased prosperity will follow. Candidates for office declare themselves opposed to exportation and the public at large seems acquiescent.

Mr. Stetson declared that Maine confronts an economic crisis in power affairs in the advance of superpower into New England. He contended with no little forcefulness that Maine is likely to gain far more by permitting power exportation from potential developments now awaiting capital than by persisting in the policy of power isolation. The benefits of interconnection apply to a whole state as well as to individual hydro-electric and steam systems. Increased taxable valuations accrue from enlarged or new electric plants, and revenue flows into many local pockets from the operation of economically justified systems. There would seem to be ample power for new industries and for interstate transmission in the Maine case; and so long as only the surplus is exported the danger of commercial injury to the commonwealth would seem to be negligible. Continued opposition to the conservation and use of resources for which the local market is inadequate spells continued waste and excessive cost of power—emphasized only too clearly in the protracted drought of the early fall.

Some evidence exists that the people of Maine may not indefinitely adhere to the isolation policy if the benefits of interconnection are made clear to them. In fact, Commissioner C. E. Gurney definitely made such a statement at the recent commissioners' conference on superpower called by Secretary Hoover. Through customer ownership, remarkably well developed in Maine, and in other ways, the utilities of the state appear to have a wonderful opportunity before them to perform constructive educational service to the public in pointing out the benefits of interstate interconnection, properly safeguarded and intelligently carried forward on the basis of expert engineering analysis and financial good judgment. Otherwise Maine stands to lose an economic contact with her sister states which, if retained and capitalized, bids fair to achieve truly great results in the conservation of national resources during the next decade.

Standardization Which Will Not Handicap Developments

STANDARDIZATION of the details of design is a thing which no sane engineer would suggest because he realizes that it would be a great hindrance to development and progress. However, there are certain forms of standardization which have been undertaken by manufacturers' organizations with benefit to themselves and the users which might be advantageously extended to other equipment. For example, considerable difficulty has been experienced by some users of electrical apparatus in providing sufficient electrical clearances even where certified drawings of the apparatus were obtained.

In almost all of these cases the objection was that the over-all height of the actual equipment was greater than indicated by certified drawings. As a consequence designs which were laid out on the basis of the certified drawings were inadequate for the service. In distribution practice, where the appearance of the poles has a great influence upon public opinion, it has also been found difficult where several makes of transformers are used to provide an attractive installation because of the variety of shapes of transformer cases and the difference in elevation at which the units will be supported by their hangers.

Another subject of importance is the lack of interchangeability of oil-switch and transformer bushings. This has been a great handicap to companies in emergencies. Some trouble has also been experienced recently with non-uniformity of pinholes in pin-type insulators.

The point to be made is that it should be possible so to standardize the maximum over-all dimension or method of mounting that appearance, ease of installation and interchangeability shall not be sacrificed. With transformers for floor or ground mounting it might be advisable to standardize the maximum over-all height of different makes of apparatus of the same rating in order that the designer of equipment shall be able to provide adequate clearance without experiencing the present difficulties.

When found necessary to improve the appearance of pole-top mounted transformers it will be up to operating companies through their national organizations to agree on whether they want "squatty" or tall transformers before any standardization can be accomplished by manufacturers.

Standardization of the elevation at which transformers will be maintained with respect to cross-arms is another thing which will have to be worked out by the N. E. L. A. committees, if it is desirable at all. While manufacturers cannot be expected to agree upon the exact length of bushings for certain voltages, it would be of considerable help to users if the maximum length could be standardized as well as the dimensions of the base of the bushing which fits into the transformer or oil-switch case. Pinholes in insulators are already standardized, but there appears to be a necessity of standardizing tolerances in order that the insulators may be screwed down on their pins equally well. Evidently the difference in pinholes comes from firing, but even then it is evident that certain tolerances should be prescribed.

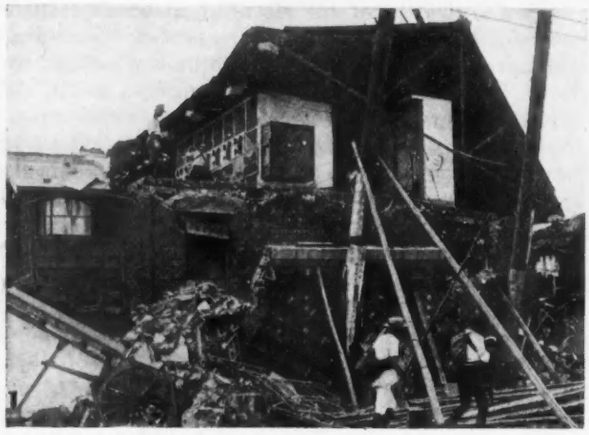
Where the users see these opportunities for standardization they can jointly agree upon their requirements in the committees now provided in their national organizations. Where manufacturers see such opportunities they can do likewise and can consult with the N. E. L. A. where they see that such standardization might affect the users seriously. In any standardization of this kind affecting both the manufacturer and user it seems almost needless to point out that there should be the closest co-operation between the manufacturing organization and the utility organization.

A Record Worth Being Proud About

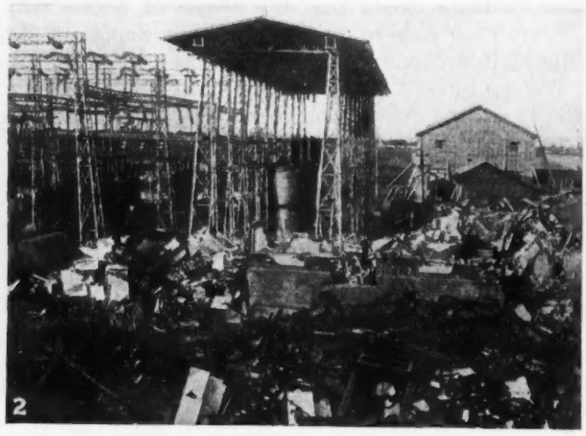
INVESTMENT bankers, in their literature and advertisements on bond sales, invariably incorporate financial and other statistics taken from letters of the presidents of the companies whose bonds are offered for sale. Naturally these statistics are informative and assuring. Some are pompous in language, but all are brief and to the point. Of the many which have come to the attention of the ELECTRICAL WORLD lately, none has told so great a story with such becoming modesty as that of Samuel Insull, president of the Commonwealth Edison Company. The company has just issued $15,000,000 of first mortgage collateral gold bonds, and in his letter to the bankers, Mr. Insull has this to say about the management:

"The company is managed by experienced public utility men, whose ability as economical and efficient operators is evidenced by the successful manner in which the severe test of the war and post-war days was withstood without an increase in rates or a decrease in dividends paid."

When it is recalled that the Commonwealth Edison Company generates more than two billion kilowatt-hours of electrical energy in steam stations yearly, that it sells this energy on a very narrow margin, that all costs increased during and after the war, and that operation in that time was oftentimes extremely difficult and capital hard to obtain, what a volume is condensed into those forty-six words! But modesty has ever been one of the elements of true greatness, and Samuel Insull's modesty has been as much a part of his character as the ability which has placed him where he is today, at the top of the electric light and power industry. In the Commonwealth Edison Company he has reared to his fame a monument more enduring than brass. It is well for the industry to note such an achievement and the zeal which made it possible.



1. The Sin-Ogawa Street substation of the Tokio Electric Light Company was crushed but not burned. Six attendants were killed in the disaster.



2. The transformers at the Kawasaki substation of the Gunma Electric Power Company survived and did gallant service after the earthquake.

Electrical Industry in Japan Devastated

NEWS of the effect of the recent earthquake and fire in Japan shows that the electrical industry suffered a loss that will exceed $100,000,000, and it will require three to five years to restore pre-earthquake conditions. K. Kambe, president of the Tokio Electric Light Company, estimates a loss of $8,750,000 to the light and power supply companies. The following itemization gives an idea of the devastation and losses: Of seventy substations, twelve were destroyed; 27 per cent of the wood poles in Tokio and 34 per cent of those in Yokohama were burned; nearly all underground cables were damaged; 1,400,000 lamps (44 per cent of the total number) in Tokio and 270,000 (46 per cent of the total) in Yokohama were destroyed; motors aggregating 58,000 hp. (46 per cent of the total) in Yokohama were burned; losses in wire, 9,500,000 yen; in substations, 5,490,000 yen, and in stocks and supplies, 2,520,000 yen. In other branches of the electrical industry 100,000 telephones and a dozen exchanges were burned, all overhead telegraph lines were destroyed, 1,000 street railway cars were burned and tracks, overhead and bridges damaged. Of the manufacturing plants the Shibaura Engineering Works, which is affiliated with the General Electric Company and makes generators and motors, was completely burned; the Nippon Electric Company, affiliated with the Western Electric Company, and the Tokio Electric Company, lamp manufacturers, affiliated with the General Electric Company, were destroyed by the earthquake and hundreds of the employees were killed and wounded; many smaller factories making cables, motors, meters, batteries, line materials, etc., either burned or collapsed. (Courtesy of S. Hirota, chief editor of the *Ohm*, Kobe, Japan.)

3. Kiobashi substation of the Tokio Electric Light Company. The brick building was destroyed, but the re-enforced concrete building was undamaged. Fire destroyed all equipment.

4. Kawasaki Works of the Tokio Electric Company was crushed but not burned and was the only example of a re-enforced concrete building destroyed by the earthquake.

5. Ginza Telephone Exchange, being re-enforced concrete, withstood the earthquake but not the fire.

6. Effect of earthquake and fire on Sitaya substation of the Tokio Municipal Electric Bureau.

Communication Over 140,000-Volt Line

Duplex Automatic Installation on Power Lines of Consumers' Power Company—Details of the High-Frequency Apparatus Used—How the Installation Is Handled by the Load Dispatcher Under Operating Conditions

By C. A. BODDIE
Radio Engineer Westinghouse Electric & Manufacturing Company

THE installation of high-frequency telephone communication on the 140,000-volt lines of the Consumers' Power Company, between Jackson and Battle Creek, Mich., marks a distinct advance in the art. The basic advantage of the high-frequency telephone is the use of the power lines themselves as a communication circuit which, owing to its superior mechanical strength, affords a more reliable circuit than the usual telephone line. For distances exceeding 15 miles this system is cheaper to install and maintain than a wire line, and it has a most promising future for central-station use.

The initial installation of the Consumers' Power Company's system is between the steam plant at Jackson and the Elm Street station at Battle Creek. These stations are connected by a three-phase, 140,000-volt, 60-cycle power line. The transmission distance is about 50 miles, being part of an extensive high-voltage system. The high-frequency currents are superimposed on and received from the power lines by antennas strung on the same towers as the transmission lines. The antennas at Jackson are shown in Fig. 1. The transmitting antenna is attached to the small insulator on the middle arm of the tower, and the receiving antenna is carried by a similar pair of suspension insulator units on the lower arm.

The complete installation of the high-frequency apparatus at Jackson is shown in Fig. 2. The transmitter and rectifier are shown at the left and the receiver is near the center of the table. The cabinet to the right contains the selectors. To the left of the receiver is the desk telephone set. This set is equipped with a standard automatic call dial and is not the one ordinarily used for the control of the equipment, but is used for communication from the high-frequecy installation and for testing.

The load dispatcher's office is in the Consumers' Power Company building, about half a mile distant from the high-frequency apparatus shown in Fig. 2. Two wires run from the high-frequency apparatus at the Jackson steam plant to the dispatcher's office, where they terminate in a standard automatic telephone desk set similar to the one shown in Fig. 2. No apparatus other than the desk set itself is located at the dispatcher's office. Complete automatic control of the high-frequency apparatus is accomplished over these two wires.

THE CALLING OPERATION

The operation of calling is exactly the same as with a standard form of automatic telephone. For example, when the load dispatcher at Jackson desires to communicate with the station operator at Elm Street, Battle Creek, he merely lifts the receiver from the hook of his desk set and dials the number assigned to the Elm Street station. The act of unhooking starts up the high-frequency telephone apparatus at the Jackson steam plant and sends out a series of modulated high-frequency impulses over the 140,000-volt power line. This impulse sequence is picked up by the receiving antenna at Elm Street, where it is led through the high-frequency receiver and after being amplified actuates a pair of relay contacts which notch up a selector. If this selector pauses on the proper contact point, a circuit is completed through the station call bell, which then rings until the station operator unhooks and answers the call. The act of unhooking starts his high-frequency transmitter and enables him to communicate with the load dispatcher, just as though he were using a standard wire-line automatic telephone. It is to be particularly noted that the installation provides for the simultaneous two-way communication called duplex; that is, both parties are able to talk and listen at the same time, as is the case with the commercial wire-line telephone.

When completed, this installation was immediately turned over to the load dispatcher and used in regular load-dispatching service. It has been demonstrated

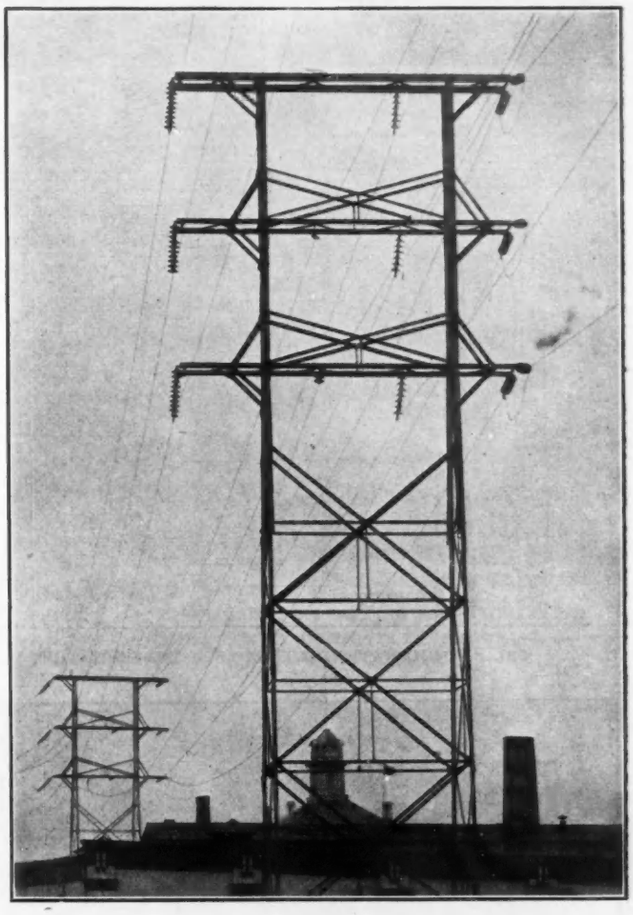


FIG. 1—ANTENNAS ARE STRUNG ON LINE TOWERS

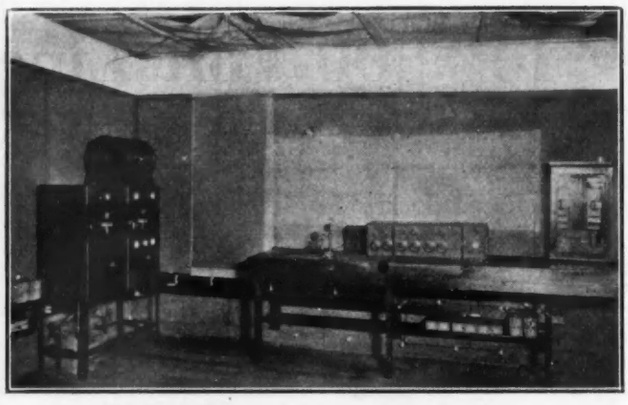


FIG. 2—COMPLETE INSTALLATION AT JACKSON

that the ease of operation resulting through duplexing is of great importance. The special features which distinguish this completed installation are:

1. It is duplex.
2. Control is entirely automatic.
3. It embodies selective calling.
4. Calling is accomplished by a standard automatic telephone calling dial.
5. Wire-line extension is accomplished by two wires.
6. The transmitter is rated at 250 watts.
7. A vacuum-tube-type rectifier is used as a source of 2,000-volt direct current instead of a motor-generator set.
8. Provision is made for automatically changing the frequencies on both the transmitter and receiver.

The duplex type of communication is a great advance over the familiar simplex system used in radio and other high-frequency systems of communication as it permits automatic control, selective ringing and affords the same flexibility and efficiency of operation offered by the wire telephone. It does away with the old lock-out scheme of depriving the listener of the privilege of breaking in or interrupting the speaker until the speaker has finished and voluntarily surrendered the initiative by stopping the transmitter and listening in. At times of emergency a verbose operator will greatly delay action, and in the confusion both parties may be listening or talking at the same time, with no result and the feeling at each end that the other station is out of operation.

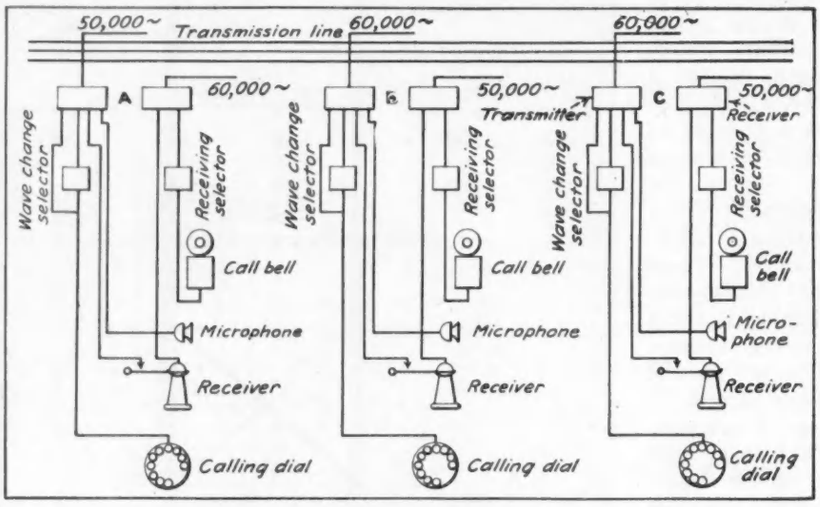


FIG. 3—SCHEMATIC DIAGRAM OF A THREE-STATION INSTALLATION

Previous attempts to obtain duplex operation in direct radio or with high-frequency current over power lines have aimed at the neutralization of the current induced in the delicate radio receiver by the local transmitter, while at the same time preserving a high degree of sensitivity to the reception of incoming signals. These attempts have usually resulted in an extremely delicate balance, owing to the fact that the transmitter output is thousands of times greater than that required by the receiver. Previous balancing methods have also been wasteful of the transmitted energy in that they usually took the form of a duplicate local antenna circuit whose purpose was the balancing out of the antenna current normally induced in the receiver circuit.

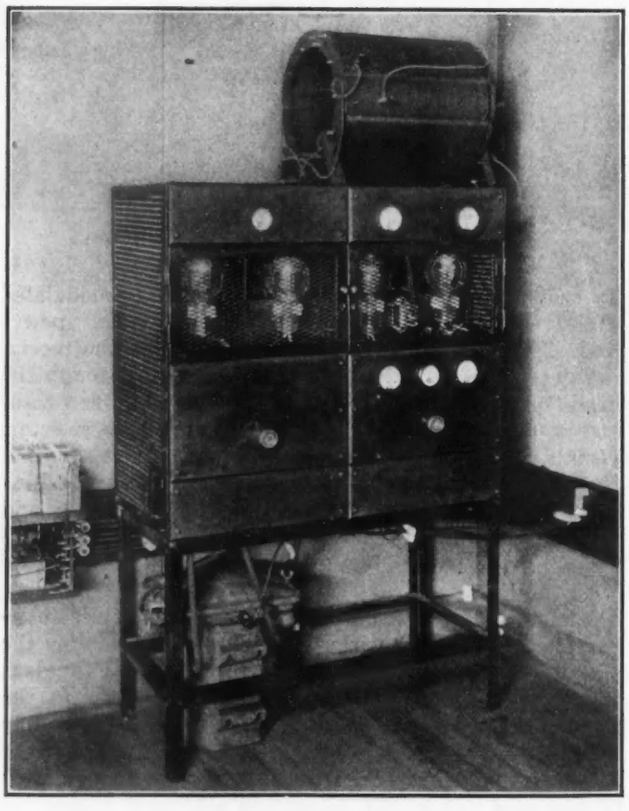


FIG. 4—A 250-WATT TRANSMITTER AND A RECTIFIER

In the development of the present system of high-frequency communication a very simple and efficient means of neutralization has been discovered. The circuits are simple, inexpensive and easily adjusted, and, further, they do not waste any appreciable amount of the transmitted energy. The system requires two antennas, one for transmission and one for reception. The general scheme of operation may be appreciated by reference to the schematic diagram (Fig. 3), which shows three stations, A, B and C. Station A is assumed to be the load dispatcher. His transmitter is adjusted to produce 50,000 cycles and his receiver is tuned to receive 60,000 cycles. All receivers in the substations with which he wishes to communicate are tuned to receive the dispatcher's frequency, that is, 50,000 cycles. The substation transmitters are all adjusted to produce 60,000 cycles, since this is the frequency which the dispatcher's receiver is tuned for. Thus there are

two frequencies simultaneously in use during a single conversation.

The balancing system adopted may be so adjusted as to balance out almost completely the pick-up from the local transmitter even when the receiver is tuned exactly to the transmitter frequency. Without this balancing circuit the current in the primary would under these circumstances amount to from 60 to 80 per cent of the transmitted antenna current. The balancing adjustment is easily made and when once attained requires no further attention.

Calling is accomplished by means of the automatic call dial mounted as part of the desk telephone set. The high-frequency transmitter starts immediately on unhooking the desk-set receiver and sends out a stream of high-frequency oscillations over the power line. When the call dial is operated this steady high-frequency current is modulated at a low-frequency rate. Thus at each closure of the call dial contact the high-frequency current is modulated at approximately a 500-cycle rate. These modulated high-frequency impulses are received by the high-frequency receivers at the various substations on the transmission line. A special relay in each of these receivers closes its contact at each modulated high-frequency impulse.

A selector in many respects similar to those used in automatic telephony is actuated by the contacts of this relay, which therefore advances one step for each impulse of the calling dial. Thus all the selectors notch up a number of steps equal to the number of impulses coming from the call dial. By means of a combination of slow and fast relays only that selector closes its call-bell contacts which happens to pause on the contact corresponding to the number dialed by the station operator. Therefore, while all the selectors notch up five steps when No. 5 is dialed by the load dispatcher, only No. 5 selector will close its call-bell contact. The call bell at this substation will then ring until the station operator lifts his receiver from its hook. Two selectors are seen in the cabinet on the right end of the table (Fig. 1). The selector to the left is the wave-chain selector, whose function is to change wave lengths or frequency. The selector to the right is the calling selector, which is operated from the contacts of the calling relay mounted in the amplifier box.

WIRE-LINE EXTENSION

The evolution of satisfactory duplex opened up the possibility of combining the voice currents supplied to the high-frequency transmitter and those delivered by the high-frequency receiver into a single pair of wires. Complete automatic control is now accomplished over two wires. This involves the operation of starting the high-frequency apparatus when the receiver is lifted from its hook, of calling when the call dial is operated, of simultaneously transmitting the microphonic currents from the desk-set microphone to the high-frequency modulating apparatus and transmitting the incoming voice currents from the high-frequency receiver to the desk-set receiver, and of ringing the operator's call bell. The energy for operating the desk telephone set comes from a storage battery installed as part of the high-frequency apparatus.

TRANSMITTER CAPACITY

The apparatus necessary for effecting the separation of the voice currents in the line intended for the transmitter and coming from the receiver is contained in a box (Fig. 6). It contains two receiving-type vacuum

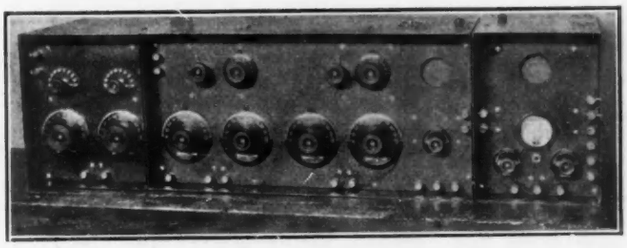


FIG. 5—HIGH-FREQUENCY RECEIVERS USED AT SUBSTATIONS ALONG THE LINE RESPOND TO MODULATED IMPULSES

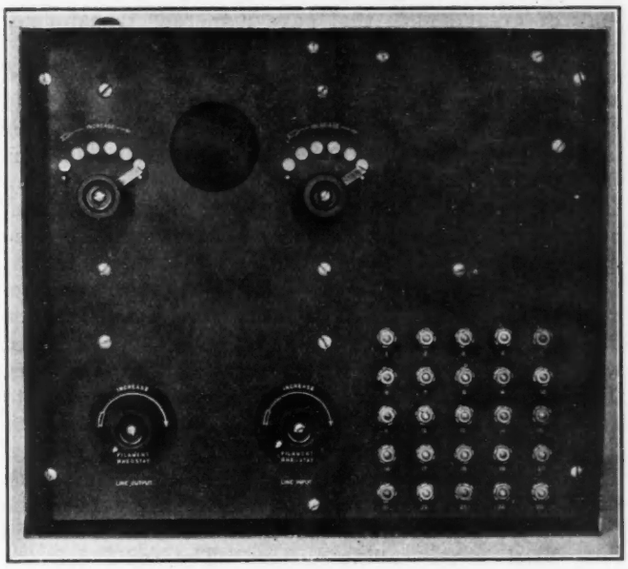


FIG. 6—APPARATUS FOR SEPARATING AND AMPLIFYING INCOMING VOICE CURRENTS BY MEANS OF VACUUM TUBES

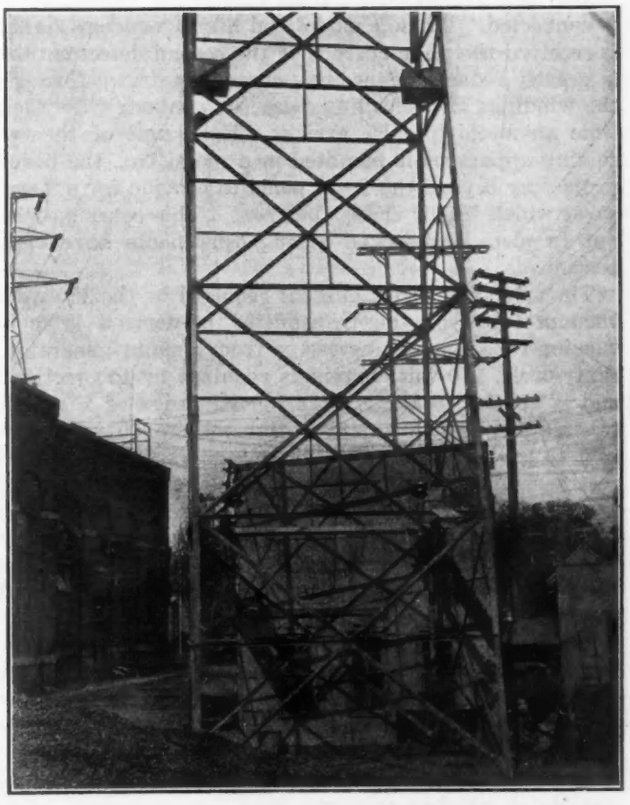


FIG. 7—INSTALLATION OF PROTECTIVE EQUIPMENT AT JACKSON

tubes for amplifying the respective voice currents from the line and means for adjusting the degree of amplification. The necessary slow and fast relays for the automatic control of the set are also mounted in this box.

Reliable communication must be insured during emergencies, as in case of storms when some of the transmission lines are down or broken. To insure communication during these emergencies, which is the very time it is most needed, ample power must be used. This installation uses 250-watt transmitting equipment, which has been found to be the desirable size of transmitter and a size for which excellent tubes of this rating are commercially available. Transmission lines of great length that have numerous transformer taps may require still larger transmitting equipment.

The 250-watt transmitter and the rectifier installed at the Jackson steam plant are shown in Fig. 4, and Fig. 5 shows the high-frequency receiver. This receiver is of three parts, and the section to the left contains the circuits for balancing out the energy picked up from the local transmitter. It is this balancing equipment which makes duplex communication possible. The middle section is the tuner and is of the coupled-circuit type. The secondary is provided with Armstrong regeneration, which may be used if necessary. The unusual feature about this receiver is that it is provided with a double tuning of both primary and secondary to enable automatic transition from one frequency to another. The pair of dials to the left belong to the primary and the pair to the right to the secondary. The section to the right is the amplifier and contains two tubes, an amplifier tube and a detector tube. The function of the detector tube is to operate the radio relay used in the calling system. The radio detector is in the tuner box. When a modulated high-frequency current is received it is rectified in the usual way by the radio detector, amplified and fed into the second detector in whose plate circuit the calling relay is connected. When a modulated high-frequency signal is received the plate current of the second detector tube is greatly reduced. Since this current is drawn through the windings of the calling relay, its contacts close each time an audio impulse arrives. Each unit of the receiving apparatus is mounted in a metal box, the boxes projecting beyond the front panel to provide for a metal cover which totally closes the front. This cover may be put in place and locked after adjustments have once been made.

The 2,000-volt direct current required by the 250-watt vacuum tubes of the transmitter is derived from a vacuum-tube rectifier instead of from a motor-generator. Sixty-cycle, 110-volt current is required by the rectifier and is applied to the low-tension windings of a simple transformer which supplies high-voltage 60-cycle current to the plates of two high-voltage vacuum-tube-type rectifier tubes. Both halves of the 60-cycle alternating current are rectified, and the pulsations in the resulting unidirectional current are entirely smoothed out by suitable condensers and inductances, thus delivering a perfectly steady direct current of 2,000 volts potential to the high-frequency transmitter.

In addition, the 110-volt, 60-cycle source is transformed to 15 volts, so that it may be used for filament supply. As a result the entire power requirements for the set are drawn from the 60-cycle source. There is no dependence on moving parts in the installation.

Two wave lengths are ordinarily used in the system, but the dispatcher only can tune the equipment, with the result that the outlying stations must all clear through the dispatcher's office, since they are all adjusted to transmit 60,000 cycles and none are tuned to receive it. If, however, it is desired to permit the outlying stations to communicate between themselves, the frequency adjustment of the calling station must be changed to agree with that normally assigned to the dispatcher.

This change-over is provided for in the sets installed at Jackson and Battle Creek and will be included as a standard feature of all future equipment. It involves provision for changing taps on the transmitter and simultaneously changing condensers on the receiver. This is automatically acomplished by the call dial. When a station operator whishes to call a station other than the dispatcher he can do so by dialing No. 10 on his automatic call dial. This notches up a selector which closes its contacts on receiving ten impulses and throws a wave-change switch in the transmitter, at the same time energizing relays in the tuner of the high-frequency receiver, which substitutes an extra set of condensers previously tuned to the new wave length desired. Thus by merely dialing 10 an operator may immediately convert himself into a dispatcher so far as wave-length adjustment is concerned, which then permits him to call any station on the system, just as the dispatcher may call any station.

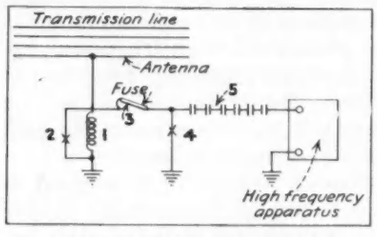


FIG. 8—SCHEMATIC DIAGRAM OF PROTECTION APPARATUS

Experience has demonstrated that it is necessary to protect against the possibility of the high-tension line coming in contact with antenna wires. The scheme adopted resembles that used for telephone lines exposed to high-voltage power lines except that it is more rugged and elaborate. Fig. 8 shows a schematic diagram of the protective apparatus. An inductance (1) conducts to the ground the 60-cycle charging current picked up by the antenna because of its proximity to the high-voltage power line. This coil acts as a low impedance to ground for the 60-cycle current and as a high impedance for the 50,000-cycle. It is an air-core inductance mounted in a weatherproof transformer case. Two rugged spark gaps are used, one shunting the inductance coil to ground and the other going to ground through the high-tension fuse (3). A group of seven condensers in series (5) separates the high-frequency apparatus from the antenna. In case of contact with the power line the high-tension fuse will blow and separate the high-frequency apparatus entirely from the antenna lead, which is then effectually grounded through the spark gap (2). Fig. 7 shows the installation of the protective apparatus at the Jackson end of the system. The boxes at the top of the tower contain the drain coils and associated spark gaps. The boxes at the lower level contain the high spark gap associated with the high-voltage fuse. The high-voltage fuses are mounted outside on the steel structure. The protective condensers are installed inside the building.

The installation at Jackson is the most highly developed yet produced and has been carried to the point where the high-frequency telephone is the complete operating equivalent of the automatic wire-line telephone. The system has already demonstrated its superiority during storm conditions.

Features of an Interconnection Contract

Essential Points of Agreement Between Four Utilities and a Commonly Owned Generating and Transmission Organization—Mutual Responsibilities and Benefits Defined with Minimum Resort to Legal Verbiage

A COMPREHENSIVE interconnection agreement was recently filed with the Massachusetts Department of Public Utilities by the Montaup Electric Company, Blackstone Valley Gas & Electric Company, Edison Electric Illuminating Company and Brockton, Mass., and Fall River (Mass.) Electric Light Company, in connection with the proposed development of a tidewater steam plant and appropriate transmission tie lines for the intersupply of energy along more economical lines than would be attainable by the enlargement of the existing plants of the last three companies. At this writing the issue of securities for preliminary work has been approved by the commission and the further development of the project is before the board. The Montaup company, formed by the three central stations named, was organized on the strength of a recent Massachusetts law permitting electric utilities to pool money for purposes of this sort. Stone & Webster, Inc., Boston, are actively interested in the project and are managers of the Blackstone Valley and Brockton companies. Because of the nation-wide interest in interconnection problems the essentials of the agreement are printed herewith.

Preamble

The contract was signed Sept. 11, 1923, by the Montaup, Fall River, Brockton and Blackstone companies. The reason for the agreement is that the Fall River, Brockton and Blackstone companies desire to secure an economical and assured supply of electric power at minimum cost in addition to the capacity of their respective steam-power stations, to meet requirements for present and increased demands and for emergencies, which may best be acccomplished by the construction and operation of a tidewater electric plant in or near Fall River, by co-operation between themselves and the Power Company. The parties agree as follows:

Article I—Term

The contract term extends to July 1, 1963, and thereafter until terminated by one year's notice by one party to the others; but in case any party fails to perform its obligations, any other party may abrogate this contract in so far as it applies to its future participation in increasing the capacity of the Power Company's station and transmission system and may withdraw from such future participation upon reasonable notice to the other parties.

Article II—Definitions

(a) "Three companies" means the Fall River, Brockton and Blackstone companies.

(b) "Purchased capacity" is the total kilowatt demand which (on Sept. 11, 1923) the Fall River company is obliged to purchase from the New England Power Company* and the Blackstone company is obligated by contract to purchase from the Rhode Island Power Transmission Company.† It is agreed that these are as follows: Fall River company, 10,000 kw.; Blackstone company, 17,500 kw.

(c) "Purchased electricity" is electricity which the Fall River company and the Blackstone company are under contract to buy under "purchased capacity."

(d) "Relayed generating capacity of the three companies" is the generating capacity of their respective existing steam-power stations with the largest generating unit out of service. These "relayed generating capacities" are agreed upon to be as follows: Fall River company, 8,000 kw.; Brockton company, 10,000 kw.; Blackstone company, 13,500 kw.

(e) "Unrelayed generating capacity of the three companies" is the capacity of the largest generating unit now installed in each of their respective steam stations. These "unrelayed generating capacities" are agreed upon to be as follows: Fall River company, 6,250 kw.; Brockton company, 10,000 kw.; Blackstone company, 20,000 kw.

(f) Each of the three companies shall provide and maintain in operation the necessary instruments to furnish a permanent record of the total demand upon its entire system at all times. The instruments, their location, installation and the method of their periodic calibration are subject to the approval of the Power Company. The original instrument records for each month are to be delivered to the Power Company at the end of that month and not over ninety days later are to be returned to the company which furnished them, when requested to do so by that company, and are to be kept for not less than five years by that company and to be available at any and all times for the inspection by any part hereto.

The "daily maximum demand" in kilowatts for each of the three companies shall for any day be taken as twice the greatest number of kilowatt-hours which it has supplied to its customers during any thirty minute interval of that day, as determined by an authorized representative of the Power Company from the above instrument records.

(g) The term "maximum demand" as applied hereunder to any of the three companies at any time shall mean the average of the highest ten daily maximum demands of such company that have occurred previous to such time.

(h) The term "unrelayed maximum demand" as applied hereunder to any of the three companies at any time shall mean the amount in kilowatts by which the maximum demand of such company at that time exceeds the sum of its relayed generating capacity and purchased capacity, provided, however, that the board of directors of the power company may by unanimous vote temporarily determine the unrelayed maximum demand of a company by some method other than the above if, in the judgment of the board, this should be done to divide the fixed charges of the Power Company equitably between the three companies.

(i) "Estimated unrelayed maximum demand" for any future period is the unrelayed maximum demand defined in paragraph (h) of this article as officially estimated by each company and approved by the Power Company.

Article III—Electricity to Be Purchased by the Three Companies

During the term of this agreement the Power Company agrees to furnish, and the three companies agree to buy, all of their respective electrical energy requirements over and above the kilowatt-hours corresponding to 167 hours' use per month of their respective relayed generating capacity and their purchased electricity under existing contracts.

The Power Company agrees forthwith to begin and continue construction of its steam-power station and the transmission lines to be owned and maintained by it in order that it may be in a position to furnish power as promptly as possible, subject only to its obtaining the necessary authority therefor.

Article IV—Apparatus to Be Installed by Three Companies and Sale of Energy to Power Company

In order to make it possible for the Power Company to supply the desired electricity and give reliable service under all conditions with a minimum investment in the Power Company, each of the three companies agrees that it will at once at its own expense construct the transmission lines which are to be owned and maintained by it and install any additional capacity in boilers or other station equipment required to make its steam station capable of actually generating power under normal conditions to the full amount of its relayed generating capacity plus unrelayed generating capacity, and will make every reasonable effort continuously to maintain its station and transmission lines in condition for such full operation, and will, so far as able, supply power to the Power Company in any amount up to the full amount of its unused relayed generating capacity plus its unrelayed generating capacity, and at any time when requested by the Power Company to do so for compensation hereinafter specified.

Article V—Respective Ownership and Maintenance of Property

By reason of the nature, location and estimated relative cost of the generating station and of the various parts of the transmission system to be installed by the Power Company which are necessary to make the interconnecting systems of the three companies properly operative, as well as the relative values of such portions of the existing steam stations, improved as specified, are to be made available for supplying power to the Power Company, it is agreed that the Power Company will provide, own, maintain and operate at its expense, and each of the three companies will provide, own, maintain and operate at its respective individual expense, certain portions, as specified below, of the total property involved, and that this division, when considered with the other provisions of this agreement, represents an apportionment which is fair and equitable to each of the three companies.

The Power Company shall provide, own, maintain and operate the following:

(a) A complete tidewater electric generating station in Massachusetts near Fall River.

(b) All required step-up transformers.

(c) All transmission lines and auxiliary equipment in Massachusetts which are necessary properly to connect its generating station with the Pawtucket and Woonsocket systems of the Blackstone company.

(d) All transmission lines, together with their auxiliary equipment, which form the portion within 14 miles of the generating station of the Power Company, measured along the transmission-line right-of-way, of the necessary and proper connection between its generating station and the system of the Brockton company.

(e) All transmission lines, together with their auxiliary equipment, which are necessary properly to connect its generating station with the system of the Fall River company at the Hathaway street substation in Fall River.

The Fall River company shall provide, own, maintain and operate the following:

(a) All step-down transformers and other equipment required for the utilization of the power from the Power Company's transmission lines.

(b) The necessary apparatus to permit proper voltage regulation and economical

*A wholesale power organization operating in Massachusetts, not a party to this contract.

†A wholesale power organization operating in Rhode Island, not a party to this contract but affiliated with the New England Power Company.

operation of the transmission lines serving its system.

The Blackstone company shall provide, own, maintain and operate the following:

(a) All transmission lines, together with their auxiliary equipment in Rhode Island which are required properly to connect its Pawtucket and Woonsocket systems with the lines in Massachusetts to be provided for that purpose by the Power Company.

(b) All step-down transformers and other equipment required for the utilization of the power from the Power Company's transmission lines.

(c) The necessary apparatus to permit proper voltage regulation and economical operation of the transmission lines serving its system.

(d) Additional boilers, amounting to at least 2,230 rated boiler-horsepower, and any other additional equipment and structures required in its steam station to fulfill the conditions specified in Article IV.

The Brockton company shall provide, own, maintain and operate the following:

(a) All transmission lines, together with their auxiliary equipment, located at a greater distance than 14 miles from the generating station of the Power Company, measured along the transmission line right-of-way, which are required to connect its system with the line or lines to be provided for that purpose by the Power Company.

(b) All step-down transformers and other equipment required for the utilization of the power from the Power Company.

(c) The necessary apparatus to permit proper voltage regulation and economical operation of the transmission lines serving its system.

(d) Additional boilers, amounting to at least 1,200 rated boiler-horsepower and any other additional equipment and structures required in its steam station to fulfill the conditions specified in Article IV.

Each of the three companies shall as soon as possible after being requested in writing by the Power Company to do so provide, maintain and operate at its own expense any equipment which may be required to improve the power factor of the energy supplied to it by the Power Company so that this power factor shall not be less than 80 per cent at the low-tension side of the Power Company's step-up transformers. Any question arising under the provisions of this article may be referred to arbitration as provided.

Article VI—Apportionment of Financing

Subject to the approval of the public authorities when required, the three companies are to finance the Power Company's initial investment by subscribing for and purchasing the capital stock of the Power Company and such of its bonds and other securities as the directors of the Power Company shall determine, at par or such other price as may be approved by the Department of Public Utilities of Massachusetts; and the aggregate amount of such stock and securities purchased by each company shall be in the proportion which the estimated unrelayed maximum demand of each company in kilowatts bears to the sum of the estimated unrelayed maximum demands of the three companies for the first twelve months during which the steam generating station of the Power Company is operated. It is agreed that the proportions of the total initial investment made by each company as above provided and the estimated unrelayed maximum demands from which these proportions are determined are as estimated:

	Proportion of Total Initial Investment, per Cent	Estimated Unrelayed Maximum Demand, Kw.
Fall River company....	47.88732	17,000
Brockton company....	12.67606	4,500
Blackstone company...	39.43662	14,000
Total.....	100.00000	35,000

Whenever the directors of the Power Company determine that the investment of the Power Company (exclusive of transmission lines) is to be materially increased to provide additional capacity or more economical operation, the investment of each of the three companies in the Power Company is to be readjusted in such manner that, after providing the additional funds, the investment of each company shall bear the same ratio to the total investment in the Power Company that the estimated unrelayed maximum demand of each company for the next following twelve months bears to the total estimated unrelayed maximum demand of the three companies in the same period.

Whenever the investment of the Power Company in transmission lines is materially increased, the resulting additional inestment shall be apportioned between the Power Company and the three companies in such manner as is fair and equitable. Any question arising under the provisions of this article may be referred to arbitration as provided.

EXHIBIT "A"

(Illustrating application of Article VII to an assumed case.)

	Estimated Unrelayed Maximum Demand, Kw.	Ratio, per Cent	Capital Furnished by the Three Companies
Fall River company..	17,000	47.88732	$2,630,451
Brockton company..	4,500	12.67606	696,296
Blackstone company.	14,000	39.43662	2,166,253
Total.....	35,500	100.00000	$5,493,000

The actual unrelayed maximum demands might in any month be as follows:

	Kw.
Fall River company.....	15,000
Brockton company.....	4,500
Blackstone company.....	15,500

Under article VII the normal capital requirements of the three companies would be determined as follows:

	Actual or Estimated Unrelayed Maximum Demand, Kw.	Ratio, per Cent	Normal Capital Requirement
Fall River company..	17,000	45.94595	$2,523,811
Brockton company..	4,500	12.16216	668,068
Blackstone company.	15,500	41.89189	2,301,121
Total.....	37,000	100.00000	$5,493,000

Adjustment to equalize investments:

Credit to Fall River company:
$2,630,451
2,523,811

$106,640 × 8 per cent ÷ 12 = $710.93

Credit to Brockton company:
$696,296
668,068

$28,228 × 8 per cent ÷ 12 = $188.19

Debit to Blackstone company:
$2,301,121
2,166,253

$134,868 × 8 per cent ÷ 12 = $899.12

Article VII—Price of Electricity Sold by Power Company

The purchase price of electricity furnished by the Power Company to the three companies shall be determined as follows:

(a) At the end of each month the Power Company shall compute the costs which shall be determined by it to be properly attributable to overhead charges, as distinguished from operating charges, such as interest or other return unon capital, taxes, insurance other than liability insurance or other insurance properly chargeable to operating, reserves for replacements, renewals, obsolescence and like items, and such costs shall be apportioned among the three companies as nearly as may be in proportion to their respective unrelayeu maximum demands based on the highest previously recorded unrelayed maximum demand or estimated unrelayed maximum demand, whichever is higher.

(b) At the end of each month the Power Company shall also compute the costs which shall be determined by it to be properly attributable to operating as distinguished from overhead, such as interest upon any current debts incurred for operating, liability insurance and other insurance properly chargeable to operating, labor, fuel, supplies, maintenance as distinguished from reserves for replacements, renewals and obsolescence, and like items not included in the computation under paragraph (a) of this article. To the costs so computed shall be added the actual cost of the electricity purchased by the Power Company. The sum of these two divided by the total number of kilowatt-hours sold by the Power Company shall constitute the operating kilowatt-hour cost for the month. Each of the three companies shall pay to the Power Company, as an energy charge, the operating kilowatt-hour cost for each kilowatt-hour of electricity sold to it. The energy charge per kilowatt-hour of electricity sold to it shall be the same for each of the three companies.

(c) The normal capital requirement of each of the three companies during any month is defined as the amount which bears the same ratio to the total capital furnished to the Power Company by the three companies that the unrelayed maximum demand or the highest previous estimated unrelayed maximum demand, using whichever is the greater in kilowatts, of each respective company bears to the sum of the three said demand figures similarly obtained.

To equalize the burden of furnishing capital when the actual amount supplied by any one of the three companies differs from its normal capital requirement, the following payments shall be made:

When the capital furnished to the Power Company by any one of the three companies is less than the normal capital requirement of such company, it shall make monthly payments to the Power Company at the rate of 8 per cent per year on such capital deficit.

When the capital furnished to the Power Company by any one of the three companies is greater than the normal capital requirement of such company, it shall receive monthly payments from the Power Company at the rate of 8 per cent per year on such capital excess.

(See Exhibit "A.")

If at any time it shall appear that the provisions herein contained result in an inequitable participation of any one or more of the three companies in the benefits accruing therefrom, upon the request of any such company there shall be a readjustment of their respective obligations and privileges hereunder by mutual agreement, or in the event of failure to agree, by arbitration.

Article VIII—Price of Energy Sold to the Power Company

The Power Company shall pay for electricity sold to it by the three companies at a rate per kilowatt-hour to be agreed upon between the selling company and the Power Company, this rate representing as nearly as possible the actual expenditure made by the selling company due to the furnishing of this electricity which it would not have incurred if this electricity had not been furnished. Any question arising under the provisions of this article may be referred to arbitration.

Article IX—Extraordinary Service

Whenever it becomes necessary or advisable for any of the three companies temporarily to make extraordinary demands for power upon the Power Company, such demands shall be granted provided the Power Company is able. If there is insufficient surplus capacity available to the Power Company to supply all of the demands in full, the available surplus power shall be divided between the companies in the proportion which the Power Company decides to be fair and equitable.

Payment to the Power Company for such extraordinary service shall be an amount to be agreed upon between the company concerned and the Power Company as being a fair and equitable settlement. If not so agreed upon, it may be referred to arbitration in the manner hereinafter provided.

Such extraordinary demands shall not be considered in computing the unrelayed maximum demand of any of the three companies.

Decision as to the existence and duration of the necessity or advisability of such extraordinary service shall rest with the Power Company.

Article X—Payment

Bills based upon the provisions of this agreement shall be rendered during the first part of each calendar month and shall be paid within fifteen days after rendering.

Article XI—Delivery, Metering and Standard of Service

The electricity furnished hereunder by the Power Company shall be delivered to the three companies as follows:

(a) In the case of the Fall River company, at its Hathaway Street substation, in said Fall River.

(b) In the case of the Brockton company, at the junction of the transmission lines of the Brockton company with the transmission lines of the Power Company.

(c) In the case of the Blackstone company, at that point or points where the transmission lines from Fall River to Pawtucket and Woonsocket cross the state boundary line between Massachusetts and Rhode Island.

The electricity furnished hereunder by any of the three companies to the Power

Company shall be delivered to the Power Company at the same points of delivery hereinabove specified.

The electricity generated by the Power Company shall be sold at the Power Company's steam generating station, and at the voltage at which the power is generated. The location of the meters necessary to determine the amount of electricity sold to each of the three companies shall be decided upon by the Power Company.

The electricity purchased by the Power Company shall be measured where it is purchased by the Power Company and under the voltage conditions at which it is purchased.

All electricity delivered shall be in the form of three-phase, 60-cycle alternating current. Except under abnormal or unusual conditions the frequency shall not vary more than 5 per cent above or below 60 cycles, and the voltage shall not vary to a greater degree than can be reasonably cared for by automatic voltage regulators. Momentary variations in frequency or voltage due to sudden or abnormal changes of load, which occur in connection with the starting up or closing down of manufacturing plants morning, noon and night, shall not be considered.

Notwithstanding the foregoing, it is agreed that the respective parties shall do all that they reasonably can to maintain a standard of service which will enable the other parties to render good service to their various classes of customers.

Article XII—Operation and Maintainence of Transmission Lines, Condensers, etc.

The Power Company and each of the three companies shall at its own expense operate and maintain the transmission lines, equipment and other property which it is to provide and own as specified in Article V. Each of the three companies shall also assume all transmission-line and transformer losses and losses in power-factor corrective apparatus in connection with all energy purchased by it from the Power Company, including losses in the step-up transformers at the Power Company's steam generating station for such energy as is generatel there. In case of energy purchased by the Power Company and resold to the three companies, each of the three companies is to pay the Power Company only for such losses as are actually incurred in the transformation and transmission of such energy purchased by it between the points where it is purchased by the Power Company and the point where it is resold by the Power Company. The Power Company shall determine the amount and value of these losses.

Article XIII—Franchises, Etc.

The obligations of the Power Company and the three companies are subject to and conditioned upon their securing and retaining all franchises, permits, rights-of-way and other rights necessary to enable each one to receive and deliver the electricity contracted for hereunder, provided that they shall take all reasonable steps to secure such rights and the consent or approval of all public authorities when required.

Article XIV—Arbitration

If any question shall arise under or in connection with this agreement concerning which the parties hereto fail to agree, any one or more of the parties hereto may request that the question be referred to an arbitrator for decision. Upon any such request, an arbitratrator may be selected by agreement of the parties hereto. If within fourteen days after the date of such request the parties shall not have agreed upon any arbitrator, the party requesting the arbitrator may within 10 days from the expiration of the fourteen days request any justice of the Superior Court of Massachusetts to appoint, and such judge may thereupon appoint, an arbitrator, who shall hear and determine the question. Such arbitrator may employ such technical advisers and incur such other expenses as he may deem necessary for the determination of the question. The expenses so incurred and the compensation of the arbitrator shall be borne by the four parties hereto in equal shares. The arbitrator shall notify in writing the parties hereto of his decision, which shall be final and binding upon the parties hereto.

The reference of any matter in dispute to an arbitrator as aforesaid for decision shall be a condition precedent to the bringing of any action, suit or proceeding, whether at law or in equity, concerning such dispute.

Article XV—Successors and Assigns

This agreement shall bind and inure to the benefit of the parties hereto and their respective successors and assigns, and the words "Power Company," "Fall River company," "Brockton company," and "Blackstone company," respectively, shall be construed to include their respective successors and assigns.

Witness the corporate names and seals of said parties, etc.

A Transformer Station of the Future

Novel Construction Proposed in Which Steel-Lined Concrete Tank of Oil Would House High-Tension Equipment, Eliminating Problems

By M. M. Samuels
J. G. White Engineering Corporation, New York City

In an article in the Electrical World for April 15, 1916, page 865, and also in a recent editorial (April 28, 1923, page 959) there was mentioned the possibility of a self-contained outdoor substation and radical changes in outdoor circuit breakers and transformers. In a paper before the American Society of Safety Engineers (see *Safety Engineering*, September, 1921, page 113) the author further expressed the opinion that to his mind the future type* of the large transformer stations would consist principally of a concrete tank for each phase located at a considerable distance from the power house and containing in the same oil the transformer, high-tension oil switch, current and potential transformers, thus saving from twelve to thirty bushings per circuit, which means saving an equal number of sources of trouble.

Since then the question has been discussed with prominent transformer engineers, switch designers and operating engineers, and the conclusion has been reached that this type of substation is not only a possibility but will in the near future become an absolute necessity.

Low-Tension Buses Being Rapidly Eliminated

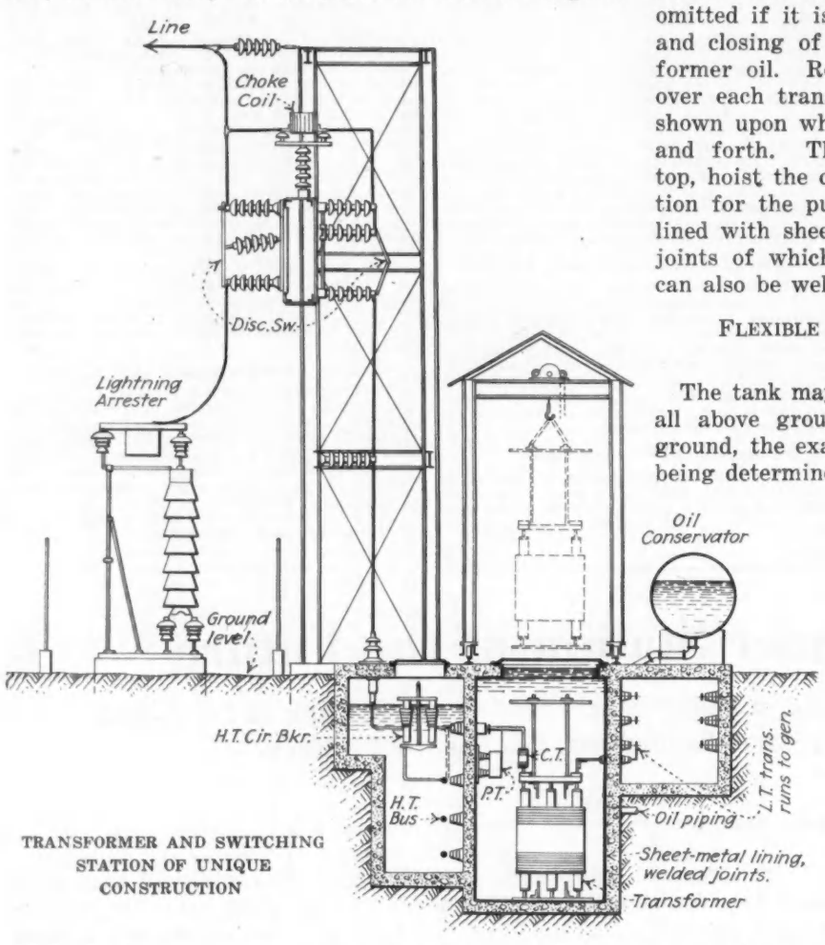
The transformer is growing larger and larger in size. Central stations are eliminating low-tension buses wherever possible and are making the transformer a continuation of the generator. Experience has shown that transformers give less operating trouble than turbine units and that the investment in large transformer capacity above the capacity of the turbine units is unwarranted and uneconomical. The tendency prevails even now to make the transformer a three-phase unit of the same capacity as the turbine unit to which it is connected, and it is generally accepted that the art of transformer design has advanced to a point where 45,000 kva. to 70,000 kva. three-phase units could be built, were it not for the difficulty of providing tanks of huge proportions. Even for many of the transformers now being built the tanks have to be shipped in sections and assembled in the field. The question at once arises, Why should it be necessary to ship a housing, which is really nothing but an enormous oil tank, from the East to the Pacific Coast and then to set this whole housing up on wheels, so that it can be moved with its oil and its transformer into a larger building for the purpose of repairs?

Oil Breaker Development Has Not Kept Pace with Capacity Demands

The second consideration of importance is the oil circuit breaker. The fact must be faced that the development of the oil circuit breaker has been rather disappointing in that it has not kept pace with the development of the transformer, and that the capacity of a central station is practically limited by the maximum rupturing capacity of the available oil circuit breaker. The idea of using oil for switching was original and epoch-making, and the well-known type H oil switch was likewise original and more or less epoch-making. But since then, in spite of the thousands upon thousands and perhaps millions of dollars spent on research,

*All patent rights reserved.

almost no new principle has been brought out, the development consisting largely in the steady increase in the volume of oil and the resultant increase in tank size, so that today the breakers used on the highest



TRANSFORMER AND SWITCHING STATION OF UNIQUE CONSTRUCTION

commercial voltages are placed in tanks which are almost as large as those of the transformers and equally difficult, if not impossible, to ship. Here again the logical question offers itself, Why make a large house movable?

Third in importance are current and potential transformers, which are a necessary evil and give the station designer an endless amount of trouble, particularly because their existence is often forgotten in the preliminary design. Why have such large housings for such small transformers?

Last but not least in importance is the bushing. The voltage of a system is virtually limited by the maximum obtainable flashover value on bushings. High-voltage bushings are not only very expensive, but every bushing is a potential source of trouble, and since the majority of bushings used in a station are not for outgoing lines but are for connecting together apparatus such as oil switches and transformers, the logical question must be asked, Why use two expensive bushings for connecting two oil tanks together? Why not combine the two oil tanks into one and eliminate the bushings altogether?

The above considerations have been crystallized into the accompanying rough design of a self-contained-oil immersed substation, which is submitted for the consideration of the profession. It is so simple that it hardly requires any explanation. It consists of a concrete tank containing the transformer, high-tension and low-tension switches, current and potential transformers, buses and connections, the only bushings required being those for outgoing lines. Barriers are provided between the switches and transformers, which may be omitted if it is found by experience that the opening and closing of switches will not carbonize the transformer oil. Removable waterproof tops are provided over each transformer and oil switch, and a track is shown upon which a housed-in gantry can travel back and forth. This gantry can remove a transformer top, hoist the core and carry it to the end of the station for the purpose of repair. The concrete tank is lined with sheet metal of say No. 10 U. S. gage, the joints of which can be welded in place and to which can also be welded the necessary water and oil piping.

FLEXIBLE ARRANGEMENT FOR OIL-IMMERSED APPARATUS IN TANK

The tank may be installed either all underground or all above ground or partly above and partly below ground, the exact arrangement in each individual case being determined to a great extent by local conditions, such as the contours of the ground, the elevation of the required railroad siding, the cost of excavation, etc.

It is not necessary to design any special transformers, oil switches or other apparatus for this new arrangement. A standard transformer with its top but minus tank and bushings or a standard oil circuit breaker with its top and mechanism but without tank and bushings can be accommodated in the new design without difficulty. In the case of an outgoing line one of the bushings may be left in its place in each phase.

The whole proposition seems to offer very little difficulty either in design or in execution, and the enormous saving is so obvious that it is hoped that some progressive operating properties, particularly those considering very high voltage, will consider it worthy of serious consideration for future installations even though it involves some rather radical departures in existing practice. It would seem to offer very great possibilities for reducing investment and operating costs and improving operating conditions.

Correction of Errors in New Edition of National Electrical Code

IT HAS been discovered that a number of errors were made in printing the 1923 edition of the National Electrical Code. It was, indeed, to be expected that in such a sweeping revision and rearrangement of so voluminous and technical a book some typographical errors would creep in. Immediate steps have been taken to announce through the publication of an official errata sheet the changes which are necessary to make the code as printed entirely correct. The errata are printed on page 37 of the advertising section in the back of this issue, within a space which will enable them to be cut out of the page and pasted directly into the code, and it is suggested that in order to make these individual corrections still more effective, they be also noted in ink on the margins of the pages where the errors occur.

European Underground Cable Practice

Conservative Loading and Installation Without Conduit—Considerable Attention Given In Manufacturing Methods to Adapting Raw Materials to Product

In Milan cables are overlapped and cut to assure close abutment. Then they are bent vertically to allow ease for inserting compound.

Extensive use is made in Europe of the practice of connecting underground cable directly up to transformer casings.

IT IS very apparent from close observation of European cables that they are operated at more conservative ratings than in this country, declared D. W. Roper, superintendent street department, Commonwealth Edison Company, in an address before the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers on Nov. 26. According to first-hand studies made by Mr. Roper, who visited ten European countries, in the summer, the full-load ratings of the cables in England corresponded to a maximum temperature of 50 deg. C., until last May, when the maximum temperature was increased to 65 deg. Several members of the cable research committee of the British Institution of Electrical Engineers who have been most familiar with the research work which has been conducted on heating of cables told Mr. Roper that they had no evidence whatever to indicate that impregnated paper insulation such as is used in England might be injured at temperatures above 65 deg. C. The man who was responsible for that temperature limitation said that the reason he objected to a higher limit was based on the difficulties anticipated from expansion and contraction of the lead sheaths and the resulting voids, which cause ionization and a shortened life of the insulation.

There is very little difference in the materials available for manufacture of European cable, except in the paper. Where American manufacturers universally use a paper that is made of manila hemp-rope fiber (the source of supply being second-hand hawsers from ocean-going vessels), some of the English manufacturers use new fiber. However, the majority of the Continental manufacturers use a wood-pulp paper in which the pulp is prepared by a chemical process and not by grinding. Whereas the American manufacturers use a petroleum-distillate impregnating compound having the consistency of vaseline, the foreign practice is to use a lighter distillate, somewhat like cylinder oil. In one way foreign and American manufacturers are alike. They are all secretive about the details of their impregnating compounds and their processes. In America only a small percentage of rosin is employed, but in England and on the Continent a much larger percentage is customary. Abroad it ranges from 10 to 50 per cent in the high-voltage cables.

In the removal of moisture and the application of the impregnating compound Continental manufacturers use several methods. One frequently employed is first to put the reels of cable in an oven after the paper, which normally contains about 8 to 10 per cent of moisture, has been applied. The cable then dries for several hours or days at a temperature somewhat above 100 deg. C. Then the hot reels are placed in a vacuum tank which is equipped with steam coils for further heating. After the vacuum has been applied and held constant for a certain number of hours hot impregnating compound is introduced into the same tank. In some cases the tank is not only filled but a pressure is applied. After the impregnating compound has been allowed to cool the reel is removed and kept a day or so in a tank of oil before the lead sheath is applied.

Other manufacturers do not do any preliminary drying in the oven. They drop the reel of cable as it comes from the paper-wrapping machine directly into a tank of oil, where a vacuum and heat is applied gradually. Then, while the oil is still quite hot, the cable is removed into a second tank which contains the impregnating compound.

Another manufacturer employs a process that is radically different. He takes the reels of paper as they come from the paper mill, which are 3 ft. to 4 ft. wide, and runs them over hot rolls heated by steam, thereby driving out the moisture. Then the paper is led through some hot impregnating compound which thoroughly fills all the pores of the paper. This paper is then led up and down through a hot-air duct in which the compound is dried. The result is like a varnished paper. After a complete drying, this roll of paper is cut into strips and applied to the conductor in much the same way as most manufacturers apply the raw manila paper. Although the question of ionization comes up in such a process, the manufacturer using it was making 30,000-volt cable in this way without apparent trouble from that direction.

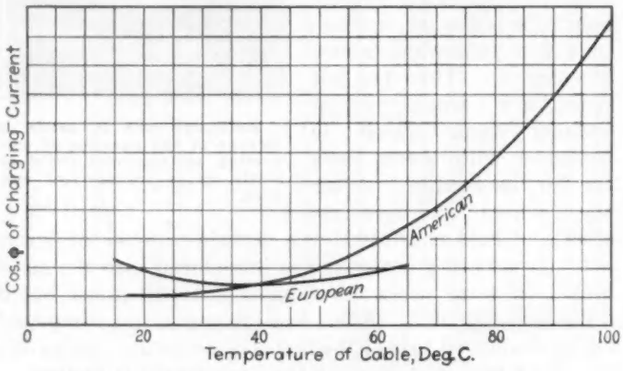
Raw Materials Receive Careful Attention

Raw materials receive more careful attention in acceptance tests in Europe than in America, according to the impression received by Mr. Roper while visiting many of the factories. Although their control tests for the impregnating process were not disclosed, evidently they watch them very closely. In the United States the principal grievance of cable manufacturers is the difficulty of getting the proper grade of raw materials in order to turn out the highest grade of cable, while in Europe the problem is quite different. Europeans are continually changing the percentages in their mixtures and the durations of drying and im-

pregnating in order to provide a fairly uniform grade of cable with a varying grade of raw material.

Another point of difference is that abroad most of the cables are laid directly in the ground, which allows the cable to operate when much cooler. Europeans use armored cable similar to that which Americans use for submarine cable. In Milan they lay armored cable in tile conduit about 6 in. wide.

A cable joint which is different from anything in this country is used in Milan. The two adjacent sections of the cable are laid so their ends overlap slightly. Then the two ends are cut at the same point (to assure close abutment) and each end is turned into a vertical position to facilitate later operations. After the lead sheath and insulation have been removed for some distance back from the ends a bell is slipped over



COMPARISON OF AMERICAN AND EUROPEAN CABLE DIELECTRIC LOSSES

the end of each cable and a template placed across the top to separate the three bare conductors. Then the bell is filled with a resinous compound which is about as hard as sealing wax when cold.

In one Parisian installation three 66,000-volt single-conductor cables are put side by side in a U-shaped trough, 2 ft. to 3 ft. long, and covered with sand over which a concrete lid is placed. The practice of running lead-covered cable directly up to a transformer casing through a terminal bell on the cable is quite common in Europe. This practice is also followed in two installations in Holland, where one 50,000-volt, three-conductor and one 50,000-volt, single-conductor cable line terminate in a substation.

CABLE TESTING

European bending tests are somewhat similar to the American tests but more severe. The standard bending test of the N. E. L. A. is that the cable shall be bent around a drum which is twelve times the over-all diameter of the cable, at a temperature in no case lower than — 10 deg. C., after which the cable shall be bent in exactly the opposite direction, and then this cycle of bending is repeated once. In England the same test is made except that there three cycles of bending are required instead of two, but at a room temperature. Temperature conditions in most of the European countries do not warrant the conducting of bending tests at a much lower temperature because not much cable is installed during freezing weather. In these bending tests is a clause which requires that the number of torn papers discovered on inspection and dissection of the cable after the bending test shall be a small quantity or zero. There has been some discussion on this point and it is difficult to get much information about it abroad. European manufacturers will say that no paper wrappings are torn. In some cases it is even specified that no paper shall be torn, but there are no standard specifications of that kind abroad. Most of the work is in the hands of consulting engineers for private companies.

Dielectric strength tests following bending are different in Europe from those in the United States. One manufacturer says that it is standard practice with him to guarantee a dielectric strength test of five times the normal working pressure before the bending test and four times the normal after the bending test. In America the standard high-voltage test after bending is two and one-half times normal. Foreign manufacturers declare that the problem of making a cable to withstand the bending test at a low temperature has not been presented to them; they have not been commercially requested to make such a cable. Regarding the dielectric-strength guarantees, there is another important difference. The highest dielectric strength test that American manufacturers will apply corresponds to about 150 kv. per centimeter as determined by the logarithmic formula. A number of foreign manufacturers are willing to guarantee 200 kv. per centimeter, and several will guarantee 250 kv.

DIELECTRIC LOSS GUARANTEES

The dielectric loss guarantees of European manufacturers are not greatly different from those of Americans, as applied to their maximum temperature. There is, however, a distinct difference in the shape of the curve, as seen in the chart. There is a striking similarity in the two types of manufacture at temperatures between 40 deg. and 60 deg. C. But it is impossible to ascertain the shape of the European curves beyond 60 deg., because measurements have not been made at such high temperatures. While American manufacturers guarantee specific dielectric losses in cables at various temperatures between 20 deg. and 100 deg., the European practice is to stipulate what the dielectric loss at one point will be between room temperature and 60 deg. Whereas the Europeans name only one figure, American manufacturers name several. In America, if it is desired to know the loss at a maximum temperature, the cable must be heated to that temperature. The foreigners measure their dielectric loss at room temperature, and they know by experiment and experience that their power factor between room temperature and 65 deg. C. is no higher. In some cases the power factor at room temperature is the same as the power factor at 80 deg. C. Where this condition exists the manufacturers can measure the power factor of every reel by a direct-reading method, thereby making sure that no reel has a dielectric loss above the guarantee.

Ionization is tested by several foreigners by observing how the power factor changes as the voltage applied to the cable is raised. Some of these manufacturers showed curves, Mr. Roper declared, that were perfectly straight lines up to about two and three times normal voltage. That meant that there was no change in power factor with any increase in operating voltage. Ordinarily, the curve will go up if no particular attention has been paid to ionization.

European manufacturers have been paying much attention to the ionization question during the past few years. Apparently, ionization is due to the action of high voltage on the air and moisture in the cable.

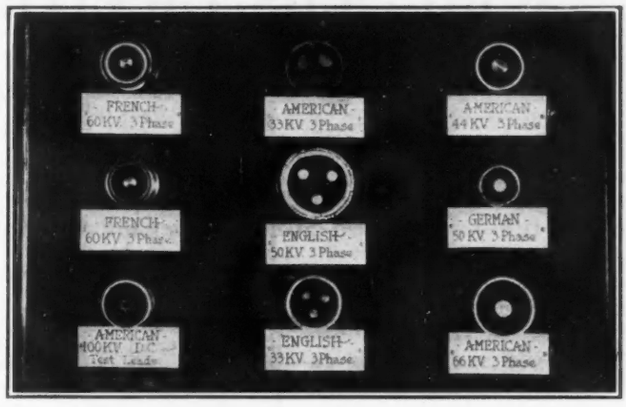
The only way to prevent it is to remove the air and moisture very thoroughly. That is one point of difference in the factory processes of foreign manufacturers. They invariably keep the reels of cable after impregnation immersed in a tank of oil until they are ready to be leaded. Then one end of the length in the oil is guided to the lead press, exposing only a few feet to the air at a time and then for only a few minutes. This is in distinct variance with the practice in America, where the cables are allowed to cool in varying degrees and removed from the impregnating tank when they are still warm, so that the compound is very fluid. In other cases the compound is in the nature of a grease, not quite as hard as vaseline. The foreign manufacturers say that they follow this practice in order to exclude the air from the insulation while cooling, thereby insuring more compound being forced into the cable by atmospheric pressure as the cable cools and contracts.

Cable Joints

Various kinds of joints from a tape joint to combinations of the hand-wrapped insulation with a form of factory-made insulation were observed, Mr. Roper reported. In one city he found a joint for a 33-kv. cable with a clearance between the nearest portions of the exposed conductors of 2½ in. Other combinations, such as a hand-wrapped joint, a joint without any impregnation excepting the compound and combinations of the two, were also in use. Apparently, the foreign impregnating compounds are of a higher dielectric strength than those used in America. They can withstand 35,000 volts across spacings that cannot be used in this country.

Regarding the proposed use of 132,000-volt cable in tying together Chicago generating plants, Mr. Roper talked with several foreign manufacturers and found that one had actually made up a sample of a cable which he had designed for 130,000 volts, three-phase. It was a single-conductor, lead-covered cable with 19.3-mm. insulation. Other manufacturers with whom he discussed the question reported various figures between 19 mm. and 22 mm. In no case did he find any manufacturer who suggested a greater thickness than 22 mm. Such a thickness and the size of the conductor would give a factor of safety of two, according to one manufacturer. When this manufacturer was asked how much more insulation would be needed in order to obtain a value of three for his factor of safety, he decleared that there is no value in adding further insulation. A greater factor of safety is not to be obtained in this way; it can be obtained only by improving the quality of insulation. As nearly as Mr. Roper could determine from conversations with the European engineers, it is perfectly feasible to secure a cable for 132,000 volts abroad. When the subject of employing such high-voltage cable was mentioned to one engineer, his first question was: "How can I get in on the experiment which you are conducting?" Another foreign manufacturer who saw a reference to the contemplated use of 132,000-volt underground cable in one of the American periodicals wrote to his American agent requesting him to inquire if he also could participate in the experiment. So it might be said that two European manufacturers have applied for permission to furnish cables for that voltage. With so much energy concentrated in the Chicago territory, with the shifting of city limits and with the economics of distribution forbidding the installation of high-voltage overhead transmission systems, the trend of development must be toward higher-voltage underground installations. Apparently, therefore, when utility companies desire to operate single-conductor cable at 132,000 volts, such a voltage cable will be made available.

Regarding the factor of safety with sector and round conductors, Mr. Roper declared that the foreigners offer a 33-kv. cable with round conductors, having a thinner insulation than American cables and a dielectric strength five times the rated operating voltage. The best that the American will guarantee is four times normal. One manufacturer offered a 33-kv. three-conductor cable, round-conductor cable with 11/64-in. insulation on each conductor and 5/64-in. insulation on the outer belt, with a dielectric strength test five times the



SAMPLES OF EUROPEAN CABLE OBTAINED DURING INSPECTION TRIP

rated operating voltage. The opinion of several engineers in this country is that the dielectric loss which some of the leading American manufacturers can guarantee is now so low that some sacrifice can be made in the dielectric loss in order to obtain a cable with higher dielectric strength and without ionization.

To reduce the lead-sheath losses several European manufacturers lay three single conductors together and then bind them as a unit. With the lead sheath thus brought in close contact, the total sheath loss is reduced to about one-third of what it would be were the single conductors to be installed in standard ducts at ordinary spacings. Most of the companies making a single-conductor cable employ a cast-metal sleeve over the joint. Different non-magnetic metals are used for that purpose. Where they wish to break the circuit through the joint sleeve for any reason they use a bushing between the split metallic sleeve and the sheath of the cable. Between the two is placed a piece of impregnated wood. In addition, an expansion chamber is provided on the sleeve to insure the maintenance of an adequate amount of compound in the sleeve.

American Manufacturers Promise High-Voltage Cable

In the discussion that followed Mr. Roper's address D. M. Simons, Pittsburgh, laid particular stress on the fact that American manufacturers have designed their cables to withstand an operating temperature of 85 deg. C. — E, where E is the operating voltage in kilovolts. The lower temperature at which European cables operate and the smaller temperature gradient produced by laying the cables directly in the ground do not impose

such serious manufacturing problems as are faced by American designers. Commenting on the tendency of Europeans to go toward thinner cable insulation, Mr. Simons expressed the belief that the American practice of using a thicker insulation is worth while in order to avoid possible breakdowns. Speaking about the relative diameters of cables, he referred to an English sample having a 300,000-circ.mil three-conductor cable with $\frac{5}{32}$-in. insulation on each conductor and in the belt which had a 7 per cent larger diameter than the standard American cable for the same conditions. Time alone will show whether cable will stand up under high voltages. Although the jump from 66,000 volts to 132,000 volts within a year's time is a large one, Mr. Simons expressed the belief that American manufacturers will be in a position to compete with the European manufacturers who are now promising high-voltage cable.

W. I. Middleton, Boston, felt that during the past years the American manufacturers have been so busy trying to produce ordinary voltage cable that they have had no opportunity to do much research work. The question that seems to confront American manufacturers is whether commercial lengths of cable can be made as good as the shorter experimental lengths now appear to be.

Who Sells Electrical Appliances?—II

A City of 200,000

"Electrical World" Survey of Retail Dealers in a Town Where the Local Electrical Family Is at Odds with Itself — Department Stores and Central Station Both Active Merchandisers

WIDESPREAD discussion throughout the electrical industry as to who is actually selling appliances has prompted the *Electrical World* to make a personally conducted investigation to determine the relative and actual volume of sales by all classes of dealers. This is the second of the series of articles in this survey covering a number of representative cities. It is found that strikingly different conditions prevail in different localities. In the city described this time the outstanding feature seems to be a chronic state of mild internecine warfare among the electrical dealers. It should be borne in mind that the *Electrical World's* representative knew nothing of the conditions obtaining prior to visiting the city, and, as stated in the first article, the facts are given as found without defense or censure of any existing policy.

LIKE the city described in the previous article, this one is situated in an agricultural belt, it is an important shipping and unloading point for a number of transcontinental railroads, and its industries are for the most part engaged in the preparation of farm products for the market. About 77 per cent of the population are native-born, 18 per cent foreign-born and 5 per cent colored. The commercial section is typical of a city of this size with a clearly defined shopping center in which most of the electrical dealers are established.

There is an electric association, of which the contractors, dealers, jobbers, manufacturers' representatives and central-station company are members. It has for its purpose bringing new industries to the city, raising the general standards of electrical work and fostering a spirit of co-operation among the various branches of the industry in the city. This organization, however, is not receiving the whole-hearted support of its members, who frequently permit their personal grievances and animosities to be aired, rather than take up some more constructive work. A number of the contractor-dealers have lost interest in the association because, so far as they can see, nothing has been accomplished toward eliminating cut-throat competition or standardizing quality. Throughout the entire local electrical family there is a very evident attitude of fault-finding and general abuse of the other fellow. This habit has come to be a sort of a "daily dozen" with many dealers, and as a consequence there is a vast amount of energy wasted. Price cutting, underbidding and criticism of competitors appear to be almost universal. Questioned individually as to why these conditions exist, each contractor or dealer declared that he was perfectly willing to hew to the line so long as the other fellow did, but the moment that unethical practices were adopted by a competitor he would immediately retaliate in like manner. It seems possible that if the present association had a paid executive manager in charge who could lay out a policy for all members and arbitrate differences which arose, the present state of affairs could be cleared up. It does not appear likely, however, that any local man could take this position, because there is too much mistrust and suspicion that he might have an axe to grind.

HARDWARE DEALERS

So far as the total volume of appliance sales is concerned, hardware stores sell less than 1 per cent and, except for the fact that they do sell a few appliances, cannot be considered as a factor in the business. They are not inclined to increase their stocks or branch out into other lines. As a rule, what appliances they have on hand are not well displayed, and a good part of the stock is thoroughly shopworn. They do not offer deferred payments on the large appliances.

DEPARTMENT STORES

There are three large department stores, two of which may be considered as outlets for electrical merchandise. The third store sells for cash and caters principally to farmer trade, so, for the present at least, electric appliances are somewhat out of its line.

Department store "C" is of the first grade, has an excellent location and is well equipped to conduct an electrical merchandising business on a comprehensive

scale. Appliances are displayed on the same floor with furniture and are in charge of the housefurnishing department manager, who is attacking the merchandising problem strictly from the department store's viewpoint. According to his own statement, he does not have to consider the energy-consumption value of appliances; it matters little in his policy how his methods of selling will affect other dealers.

In selecting its stock of electrical appliances the store has gradually felt out the desires and preferences of its customers to determine what types and makes are most popular. For instance, in the case of washing machines it has been found necessary to stock five different makes. By so doing the manager feels that he can furnish customers any style or type of washer that they may desire, and it also gives a minimum and maximum range of prices so that sales are not lost when a customer thinks the machine too costly. Of the other large appliances not so wide a variety is carried, but the store is testing out two makes of ironing machines to determine which it will stock. Of heating devices two standard makes are sold, and the store is closing out a few low-priced appliances which it had on hand.

The manager of the housefurnishing department had no criticism to offer of the central-station company's merchandising methods. In fact, he stated that he felt that advertising and promotional work done by the local company was of direct benefit in increasing sales in the city. He had no objection to the long-time payments on high-priced appliances, as his store also offered the same terms to customers. In his opinion the contractor-dealers and the electric shops were not warranted in their criticisms of each other or the central-station company for any existing selling policies, and he pointed out that the more business done in a given territory or among a given population, the more there would be for each dealer or store.

The question of discounts on appliances appears to be satisfactory to this manager, but he called attention to the larger buying power of the department stores over that of the small dealers. Virtually all purchases are made direct from the manufacturers, and wherever possible carload lots are ordered. The store's total sales of electrical merchandise for 1923 will approximate $175,000, which will be an increase of almost 50 per cent over those of last year. While this rate of increase is not expected to continue from year to year, the store is confident that there will be a steady growth of the business for some time to come and is making definite plans to increase its facilities for handling electrical appliances, perhaps even going so far as to create a separate department.

Department store "D" is as large as the first one. However, not so much attention is paid to appliance sales, and the total volume of business for the present year will be approximately 40 per cent that of the other store. The attitude of the manager was that electrical appliances naturally are a part of the housefurnishing business, and therefore it is a logical line for a department store to carry. The business of this store has grown steadily, although not at such a rapid rate as the other. Not so much attention is given to the advertising or display of merchandise, which is distributed pretty much throughout the housefurnishing department and not confined to any one place on the floor. This manager also made no criticism of the methods or terms offered by the central-station company and felt that its promotional work was of benefit to others.

CONTRACTOR-DEALERS AND SPECIALTY STORES

All wiring contractors and fixture dealers, as well as specialty stores, carry electrical appliances to a greater or less extent. There are a few factory branch stores and also a few stores doing solely an appliance business.

SALES OF PRINCIPAL ELECTRICAL APPLIANCES, SHOWING QUANTITY, VALUE AND PROPORTION SOLD BY HARDWARE STORES, DEPARTMENT STORES, ELECTRICAL DEALERS AND THE CENTRAL-STATION COMPANY

Kind of Dealer	Washing Machines	Vacuum Cleaners	Ironers	Flatirons	Curling Irons	Toasters	Percolators	Total Sales Each Class of Store	Per Cent of Total for City
Hardware Stores:									
Store "A"	5	.....	.....	40	25	18	15		
Store "B"	.....	.....	.....	60	30	24	12		
Total	5	.....	.....	100	55	42	27		
Value	$600	.....	.....	$600	$247	$252	$314	$2,013	0.3
Per cent of electric appliance sales	30.0	.....	.....	30.0	12.2	12.4	15.4		
Department Stores:									
Store "C"	650	400	10	1,200	1,200	200	250		
Store "D"	325	250	.....	600	650	125	120		
Total	975	650	10	1,800	1,750	325	370		
Value	$121,875	$34,025	$1,500	$10,800	$7,875	$1,950	$4,440	$182,465	24.8
Per cent of electric appliance sales	66.3	18.6	1.3	6.0	4.4	1.0	2.4		
Electrical Dealers:									
Dealer "E"	250	30	.....	30	24	24	15		
Dealer "F"*	650	350	100	600	550	350	50		
Dealer "G"	.....	.....	.....	50	60	24	12		
Dealer "H"	6	15	.....	175	100	100	15		
Dealer "I"	15	20	.....	500	250	250	36		
Dealer "J"	125	100	.....	350	300	150	48		
Dealer "K"	225	175	.....	250	200	75	36		
Dealer "L†"	200	125	.....	50	75	24	18		
Dealer "M"†	300	200	25	75	60	48	24		
Dealer "N"	12	15	.....	60	36	24	15		
Total	1,783	1,030	125	2,140	1,655	1,069	269		
Value	$222,875	$54,075	$18,750	$12,840	$7,447	$6,414	$3,228	$325,629	44.2
Per cent of electric appliance sales	68.5	16.6	5.8	3.9	2.3	2.0	0.9		
Central-Station Company:									
One company	1,125	950	100	1,650	750	700	300		
Value	$140,625	$49,875	$15,000	$9,900	$3,375	$4,200	$3,600	$226,575	30.7
Per cent of company's electric appliance sales	62.0	22.0	6.6	4.4	1.5	1.9	1.6		
Grand Total:									
All dealers	3,888	2,630	235	5,690	4,210	2,136	966		
Value	$485,975	$137,975	$35,250	$34,140	$18,944	$12,816	$11,582	$736,682	100.0
Per cent of total sales	66.0	18.7	4.8	4.7	2.6	1.7	1.5		

* Electrical store. † Specialty or factory stores.

As mentioned previously, there is a considerable distrust of competitors among these dealers. This appears to be well founded, in view of several instances which were related.

Dealer "E" had been in the electrical business only for the past three months, having come into the store as a partner in a firm suffering from dry rot. His views of the local situation are interesting because of this fact and his prejudices, if any, are not of long standing. He felt that the local central-station company was a fair competitor, that its selling policy was constructive and of benefit to other dealers, that it had been chiefly instrumental in the promotion and introduction of electric appliances to the public, and that criticism of its methods was unjust and short-sighted. He declared that more unethical practices were being pursued by contractors and dealers than by any one else and that they themselves were to blame for the difficulties they were in. Competition among the salesmen of different dealers is keen, and many expedients are resorted to in order to effect sales. Among these are the rebating of their commissions to customers, the placing of two appliances on competitive trial at the customer's premises at the same time, and, if necessary, rebating the down payment that had been made on the first appliance. The common practice of some salesmen has been to follow the delivery wagons of their competitors and attempt to have one of their machines installed at the same time. He believed that if the other dealers were to hang together, agreeing to discontinue such practices, and really adhere to such a policy, there would be very little difficulty among the electrical retailers of the city. He was very pessimistic, however, as to the possibility of getting the men together on any working basis.

Would Boycott Manufacturers

Dealer "F" conducted a strictly electrical store with electric washing machines as the leading appliance. His sales were far larger than those of any other strictly electrical dealer in the city, and he is also the oldest hand in the business. He conducts his business on an extensive advertising and campaign basis in conjunction with the manufacturer. Direct-by-mail broadside advertising is used, followed up by outside salesmen. He also criticised competitors for some of their practices and felt that the central-station company was over-reaching itself in extending the long-time payments and, to a certain extent, was encroaching upon his field. Department-store competition was not, in his belief, becoming serious, but these stores, he thought, had no business selling electrical appliances. He asserted that jobbers or manufacturers who sold to the department stores should be boycotted by the electrical dealers.

Dealer "G" was essentially a lighting-fixture store, did no wiring and carried a small stock of appliances, total sales of which do not amount to more than $1,000 or $1,200 per year. He had the same general complaints to make against his competitors in the fixture business that other dealers had against theirs in the appliance business. Much of his business, he said, was taken on a competitive price basis, and underbidding one another was common among dealers. He had little to add or suggest further than to corroborate the statements that have already been recorded.

Dealer "H" was a contractor carrying a limited line of appliances, and most of his business was confined to wiring and the sale of fixtures. Regarding the sale of appliances, he also complained of the practices of other dealers and believed that the central-station company was offering too easy terms on the larger appliances. He believed that he could do a much larger business if it were not for the easy terms offered by others.

Dealer "I" was probably the largest contractor-dealer in the city and kept a very attractive store. A large wiring and fixture business was done, and all the appliances carried were of standard makes. Appliance sales are made either directly from the store or to new wiring customers at the time that work is being done for them. No outside men are employed. This dealer also criticised the central-station company for its time payments and was even of the opinion that the company should retire completely from the sale of appliances. Criticism of other dealers followed the same vein as previously noted.

Dealers "J" and "K" were really the same dealer, but two stores were conducted in different parts of the city. This one did not criticise the practices of the central-station company, but his attitude toward other electrical dealers was pretty much in line with the general sentiment. He said that the existing conditions simply meant that so long as they continued they would be met with an antidote of the same kind. The class of salesmen employed had a great deal to do with the matter of price cutting and rebating of commissions, but he did not know of any way this could be controlled so long as the owners themselves appeared to approve of it. Asked if he thought the local electrical association could do anything about the situation, he said only if it appointed a dictator from some outside city.

Dealers "L" and "M" were factory branch stores, and the managers of both declared that competition was very difficult. When told that they had been accused of questionable practices in making sales, they admitted that it might be true, but said it was simply a case of retaliation and that they were no more guilty than the other dealers had been. They were not inclined to criticise the central-station company's practice, but felt that every electrical dealer in the city was suffering from the sales methods and competition which had become so prevalent.

Central-Station Company

Merchandise sales are conducted by the central-station company primarily on a profit-making basis, and the energy-consumption value is of secondary consideration. The salesroom is in a very good part of the shopping center and it is very well equipped for the display of appliances. In addition to the sales force employed in the store, there is a crew of eight men working in the territory all the time. This year's appliance sales are running between 40 and 50 per cent ahead of those of last year. All advertising and sales campaigns are well thought out and planned beforehand, so that lost motion and wasted effort are reduced to a minimum.

The general manager and the commercial manager of this company deplored the existing conditions, but stated that they were at a loss to know what they could do further to remedy the situation. They feel that they are conducting their appliance business on an ethical basis; they are making a real profit out of it and are not selling appliances at a reduction because of their energy-consumption value.

From the foregoing it is apparent that the general discontent of the electrical contractors and dealers is pretty much a chronic state of mind and a matter of

habit. That this is so is evident from the attitude of both the department stores in the city, neither of which complained of unfair competition nor criticised the selling methods of its competitors. It seems very probable that if both the central-station company and the department stores were out of the business, the contractor-dealers would find just as much to complain about as they do now.

At the present time, eliminating the hardware stores from consideration, appliance sales are divided among department stores, electrical dealers and the central-station company as follows: Department stores, 24.8 per cent; electrical dealers, including specialty and factory branch stores, 44.2 per cent; central-station company, 30.7 per cent. Both the department stores and the central-station company are becoming better organized to handle the business, and it appears certain that their sales will increase at a more rapid rate than those of the electrical dealers. The latter are inclined to give too much attention to their troubles, and the form of competition which they indulge in will tend to retard their sales. Therefore it appears that within two or three years appliance sales may be divided about as follows: Department stores, 33 per cent; electrical dealers, 30 per cent; central-station company, 37 per cent. It may be that department stores will show a greater increase than this, but this tendency is offset largely by the general popularity of the central-station company, which appears to have the good will of its customers. They like to patronize the company because of the terms offered, its acknowledged reputation in giving service, and the fact that it seems to be the logical place for the average customer to go when he wants to buy an electrical device.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Who Is to Sell the Lamps?

To the Editors of the ELECTRICAL WORLD:

I have been considerably interested in reading the article "Who Sells Electrical Appliances?" in the ELECTRICAL WORLD of Dec. 8, but it seems to me that one very important item of information concerning conditions in the city under consideration is left out of the story, namely, the policy of the central-station company operating in that territory in regard to the sale of lamps. I do not believe the question can be given fair consideration without a knowledge of this policy, for whatever may be the attitude of the central station on the subject of merchandising appliances, if its policy on the sale of lamps is to give free renewals or sell at less than standard prices, it is unreasonable to expect straight electrical stores to do a satisfactory and profitable business.

Other outlets—namely, department stores, hardware stores and the central station itself—have attractions for the ordinary purchaser aside from electrical goods, and if the electrical store is practically cut off from the sale of the one item in its line which everybody buys, then its only chance is somehow or other to drag its customers in. There will not be any chance of their voluntarily coming to the store to purchase something in the nature of an every-day requirement, thus providing an opportunity to present to them the advantages of purchasing appliances which the store may carry. F. E. STOW.

H. C. Roberts Electric Supply Company,
Philadelphia, Pa.

[In this, the first city surveyed, the lamp situation is entirely normal—that is, the central-station company sells at list and dealers can do a legitimate retail lamp business. In some cities already studied, however, central-station lamp policy does offer unmeetable competition and is a disturbing factor in the local merchandising situation. As the analyses of these communities are presented this condition will be clearly stated.—EDITORS.]

Opposes Plans to Light Country Highways by Electricity

To the Editors of the ELECTRICAL WORLD:

The illustration printed on the cover of the Dec. 8 issue of the ELECTRICAL WORLD, entitled "Country Highways Are Not Satisfactorily Lighted by Jove's Thunderbolts," as well as articles that have appeared in its columns from time to time pointing the same moral, bring up a matter well deserving of serious thought on the part of engineers throughout the country.

Naturally, it is the aim and purpose of engineers and central-station organizations to foster the multiplication of uses of electricity, not alone for the increased business resulting, but more especially to render an additional helpful service to humanity. But I do not believe an engineer who is a builder wishes to see his efforts spent in what seems to be little more than competition with the stars. There are only three classes that can be benefited by highway lighting—namely, pedestrians, those using horse-drawn vehicles and those using motor vehicles—and I believe any agitation in favor of highway lighting is based solely on the claim that it will benefit motorists. Most motorists will agree that any kind of light, except their own, works to their disadvantage, except on foggy nights, and even then the value of outside lights is doubtful. Street lights in cities cast objectionable shadows, and if their sole purpose were to assist motor travel, they would soon disappear.

In this day of ever-increasing tax burdens much care should be exercised in advocating any public improvement which is of such doubtful value as this. I firmly believe that a steam central station would do better to seek a residence electric heating load than country highway lighting. The only difference is that the former is a proved quantity of inefficiency, while the latter is anybody's guess. E. J. DEL VECCHIO.

Akron, Ohio.

[That part of the taxes allotted to street lighting is one of the few public expenditures which are of benefit to every taxpayer. It is small in comparison with others, and often its results are equally small. Were it not for private lighting, such as is furnished by store windows, electric signs and other displays due to individual enterprise, most of our streets would be dim and dismal as soon as night falls, for very few of them are adequately lighted. Yet good lighting is not only essential to safety, but chiefs of police have time and again attested its value as a deterrent to crime. Country highways should be made as safe and as convenient for traffic as city streets. To pave them is not enough; they should be lighted as well. Roads are built for travel. If they are to be illuminated only by the stars, they fail in their purpose. All over the country macadam has replaced mud; but the job will be only half done till electric lamps at proper intervals dissipate the darkness.—EDITORS.]

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Analysis of Itemized Coal Mine Costs with Utility Service

THE total cost of cutting, hauling, hoisting, pumping, screening, loading, lights and incidental power for three totally electrified mines in Illinois was approximately 5 cents per ton during 1921, according to a paper on the use of central-station power in coal mines presented by C. O. Dunten, commercial manager Central Illinois Public Service Company, before the September meeting of the Great Lakes Division, N. E. L. A., at French Lick. The 1922 figures had not been used because of the five months' coal strike that year. The accompanying table shows the energy consumption, the days worked and the cost per ton for one mine employing approximately 500 men, with the shaft depths varying from 370 ft. to 415 ft. and mining a 7-ft. vein.

The advantages of a mine purchasing power rather than generating it are: (1) A large reduction in power cost per ton of coal produced; (2) greater flexibility for increasing the capacity within short notice; (3) independence from water supply; (4) reliable power supply during strikes; (5) low operating costs during strikes; (6) elimination of a large amount of labor; (7) reduction of time for repairs; (8) lowering of initial investment for generating equipment; (9) ability to mine coal at a greater distance from the shaft with very little increase in investment or production costs.

Power is required in the operation of a mine for four principal purposes—operating mining or cutting machines, haulage locomotives, hoisting and the operation of ventilating fans. The haulage locomotives require about 30 per cent to 40 per cent of the total power requirements for the mine and supply a very satisfactory load from the central-station viewpoint. Mining machines require 12 per cent to 18 per cent of the total power requirements of the mine, while the power for hoisting varies between 10 per cent and 20 per cent. This last load is probably the most undesirable unless proper equipment is installed. Because of the first cost, coal-mining operators usually desire to put in hoists operated by alternating-current motors, which will cause great instantaneous peak demands on the central-station system. It has become customary in the larger mines, however, to install a motor-generator set having a large flywheel and using a direct-current motor on the mine hoist. Operation of fans requires from 15 per cent to 20 per cent of the total power and is the best load from the central-station standpoint. It is necessary to operate the fan twenty-four hours a day for proper ventilation and usually thirty days per month.

The easiest load for a central station to obtain from an old mine is the cutting and haulage load. As the working face of a mine recedes from the shaft the power requirements for haulage increase continually. Those mines which use direct curent finally reach a point where it is necessary at heavy expense to install additional generating equipment and heavy feeder cables from the engine room to the working face. The operator realizes that it is only a question of time when further expenditures will be required and a point is reached where it is no longer economically possible to transmit direct current to the working face. Under these conditions the mine operator is usually receptive to the consideration of purchased power with its greater flexibility.

When the working face of a mine is within power-transmitting distance of the shaft, the motor-generator sets are usually installed in the engine room so that the direct current can be transmitted through cables extending down either the air or main shaft and along the entries to the working face. Recently, however, the practice of installing the motor-generator sets in the mine below ground, close to the working face, has come into being. Alternating current is transmitted by power lines above ground to a point directly over the point where the motor-generator set will

TABLE II—DISTRIBUTION OF POWER IN A COAL MINE

	Kw.-hr. per Ton	Per Cent Total
Power, top works	0.39	17.2
Power for hoist	0.76	32.8
Power for motor-generator set	1.10	47.9
Power for alternating-current machines at bottom	0.05	2.1
Total	2.31	100.0

TABLE I—OPERATING COSTS OF A COMPLETELY ELECTRIFIED MINE IN ILLINOIS

Month, 1921	Tons	Days Worked	Kw.-hr. Consumption	Bill*	Cost, Cents per Kw.-hr.	Kw.-hr. per Ton	Cost, Cents per Ton
January	34,826	19	125,700	$2,485.44	1.98	3.61	7.13
February	36,727	15⅞	104,600	2,232.92	2.13	2.85	6.08
March	51,357	22	121,600	2,455.42	2.02	2.37	4.78
April	39,799	15⅝	94,700	2,129.06	2.25	2.38	5.35
May	38,902	14	87,000	2,145.17	2.5	2.2	5.50
June	54,466	19⅝	107,200	2,279.85	2.1	2.0	4.20
July	47,458	20	101,500	2,217.55	2.2	2.2	4.70
August	59,253	23⅝	121,700	2,448.07	2.0	2.0	4.10
September	57,598	19¾	129,600	2,553.05	2.0	2.3	4.40
October	55,695	18⅛	107,000	2,585.33	2.4	1.9	4.70
November	44,602	14	106,300	2,618.55	2.5	2.4	5.90
December	64,509	19⅛	143,300	3,072.08	2.1	2.2	4.80
Total	585,286	222⅜	1,350,200	$29,222.48	....	....	....
Average	48,774†	19.36	112,517	2,435.21	2.16	2.31	4.98

* An overhead charge of $1,429.27 on transmission line is included under billing.
† Summary average per day of tons, 2,630.

be installed. A drill hole is then made from the surface to the mine and a 2,300-volt, three-conductor cable is installed in the drill hole to the motor-generator set. This method of operation has increased the life of some of the older mines to a great extent, since it permits the mining of small patches of coal in isolated sections which could not be mined by direct-current power on account of the distance factor.

In making a rate schedule to serve coal mines the low kilowatt-hour used per kilowatt of maximum demand must be taken into consideration. In making a rate schedule one must keep in mind the great diversity factor which exists between many individual loads and which results in the central station being operated at a high load factor. Coal mines show this diversity among themselves, and their peak loads do not occur simultaneously with those of other industries. As a usual thing, a rate averaging between 2½ cents and 3 cents per kilowatt-hour will show a material saving to the average coal mine over its present power-production costs. The mines that are operating their own power plants will show a much higher operating cost if accounting methods are correctly used, because most mine operators are not aware of their actual operating costs in a great many instances.

Protecting Fire Equipment Against Freezing

By G. H. McKelway
Westfield, N. J.

THE following rules for the protection of fire equipment against freezing have recently been issued by one of the large public utility companies in the East, this company being the owner of a number of power plants and substations as well as other buildings which are equipped with sprinklers, hose lines, fire extinguishers, etc.:

The engineering department will see that standpipe systems are drained where there is danger of freezing, valves controlling the supply of water to be closed and sealed and signs posted on the valves and the usual places about the premises indicating the location of the controlling valve. The hose is to be disconnected and the valve left open for a period of one week, then to be closed by the foreman in charge of the premises, who will also see that the hose is reconnected. The seal on the main controlling valve is to be broken only in case of necessity arising for operation of the standpipe system—that is, in case of actual fire—after which the engineering department will reseal the controlling valve and the hose will be disconnected and drained and then reconnected as above.

The foreman in charge of the premises will see that all water pails in exposed locations are emptied and filled with clean, dry sand to within two inches of the top; that all sand pails are inspected, and where it is found that the sand has caked by reason of moisture the pail is to be cleaned and then refilled with clean, dry sand. All water barrels in exposed locations are to be filled with a saturated solution of salt and water, this also to be taken care of by the employee in charge of the premises. All chemical extinguishers in locations exposed to frost are to be removed to heated quarters, and all concerned are to be notified.

Two Weeks to Assemble 22,000-Hp. Wheel

FACED with a possible curtailment of power service due to low water in other parts of its system, the Georgia Railway & Power Company recently succeeded in putting into operation a 22,000-hp. waterwheel generator at the Tugaloo development within two weeks after the stator and rotor were received. It was necessary to wind completely both parts and assemble together with the waterwheel. The permanent switchboard not having arrived, the only instruments available to control the operation of the wheel were an ammeter and a voltmeter. It became necessary to utilize the synchroscopes in the Tallulah Falls plant, 4 miles away, to get the unit onto the system. Since the wheel has been in service it has given complete satisfaction.

Investment Costs in Hydro Developments

DISCUSSING the items entering into the cost of water-power development in the second Aldred lecture before the faculty, graduate and senior students of the Massachusetts Institute of Technology on Nov. 23 last, Julian C. Smith, vice-president and general manager Shawinigan Water & Power Company, Montreal, presented the accompanying tabulation of the proportional investment as typical. Commenting upon this tabulation, Mr. Smith said that about 35 per cent is made up of items not connected with direct expenditures in the field; about 20 per cent is for temporary equipment like cofferdams, tracks, etc., which might be called preliminary work, and only about 47

Form Used by a Large Southern Company for Inspection of Oil Circuit Breakers

Inspection Report Form for Types C, C-O, H 3 and H 6 Oil Circuit Breakers

Name of breaker. Type. Serial No.

Amperes. Volts.

1—Are breaker and mechanism free from dirt and dust?
2—Are all bolts, nuts, cotter pins, etc., in place and properly tightened?
3—Are all bearing surfaces of the mechanism properly lubricated?
4—Are contacts properly aligned and do all contact surfaces bear with a firm and uniform pressure?
5—Are the circuit-interrupting contacts and arcing tips badly burned or pitted? Are they of the proper length?
6—Are all terminal connections properly tightened?
7—Is the oil at the proper level in the tanks and in good condition as required?
8—Are bushing insulators through the cell and tanks tight in their clamps and are the tanks held securely?
9—Are wooden riser rods tight in top levers and in cross-heads or moving contacts?
10—Will the electrical operating mechanism operate breaker over range of voltage 140 to 280, trip and close?
11—Will breaker operate by hand?
12—Are solenoids, signal switches, control relays, drum switches and wiring O.K.?
13—Are magnet clutch, cams for motor switch and tripping mechanism in good operating condition?
14—Make a report of condition of breaker when inspected and how left after inspection.

Date *Sign* *Remarks:*

per cent represents money going into permanent work.

Touching upon probable future developments in water-power engineering in its broadest sense, he pointed out that modern waterwheels operating under good conditions develop more than 90 per cent theoretical power. The possible gain here is not more than 4 or 5 per cent at best. The generators have efficiencies ranging from 95 to 97 per cent, and it is more a question of the amount of money one wishes to spend in the design and construction of a generator than any other factor that determines the maximum efficiency. Mr. Smith believes that generators of 98 per cent efficiency can be built if the purchaser is prepared to pay the price. The general arrangement of waterwheels and generators and the design of power-plant structures have in the last few years become more or less standardized.

If the speed of the generating units can be increased for a given head or if the speed of the water through the passages can be increased so that the passages can be made smaller, the over-all cost of the power plant and machinery will be reduced. Recent designs in some cases involve about double the speeds of Francis turbines under the same head for the same power. It is a fair assumption that by doubling the speed the cost of the electrical machinery can be reduced by 25 per cent, which means a reduction of 2 or 3 per cent in the total cost of development—a substantial and worth-while saving to work for in the future.

TYPICAL PERCENTAGES OF INVESTMENT COST IN WATER-POWER DEVELOPMENT

	Per Cent
Preliminary work, including expenses of engineering reports, legal advice, etc.	2
Lands, etc.	7
Discount on bonds	9
Interest during construction	9
Legal	1
Engineering and superintendence	5
Head office expenses	2
Insurance	1
Construction of buildings and camps	2
Construction plant	9
Cofferdams and tracks	7
Dams	13
Power house	13
Machinery	18
Operators' houses, roads, miscellaneous	2
Total	100

Unbalanced Electric Range Loads

Causes of Poor Voltage Regulation—Small Auto-Transformer as Part of Range Suggested as One Means of Overcoming Trouble

BY PAUL P. ASHWORTH
Distribution Engineer Utah Power & Light Company, Salt Lake City, Utah

GOOD voltage is essential to the satisfactory operation of an electric range. How to maintain good voltage at the terminals of the range and at the same time keep down the investment in distribution facilities to a point where electric range business is really profitable has been an important consideration to the distribution engineer. The heat developed in the elements of the range varies as the square of the voltage impressed. If the voltage is 10 per cent low, the heating will be 20 per cent below normal. Slow heating, the objection that is often raised to the electric range, is very often due to an unbalanced load, caused by the range itself, on the two sides of a three-wire secondary line serving the range.

An unbalance of 1,500 watts on one side of the line produces twice as much voltage drop to neutral as a balanced load of 3,000 watts equally divided with 1,500 watts on each side of the line. With 220 volts it is possible to handle four times the load with the same percentage of voltage drop to neutral as with 110 volts.

Take, for example, a range having two 1,500-watt elements on the same side of the line. If these two elements are the only ones in use, as will frequently happen during certain cooking operations, the percentage voltage drop to neutral on that side of the line will be the same as if a balanced load of 12,000 watts was carried on the three-wire circuit. With three 1,500-watt elements on one side of the circuit the regulation will be the same as that for a balanced load of 18,000 watts.

A consideration of these facts gives some idea of the havoc raised in voltage regulation by an unbalanced load on a three-wire secondary distribution circuit. The following suggestions are offered as possible solutions of the problem:

1. Install wire and transformers of sufficient size to give good voltage regulation even when the load is badly unbalanced. This method would make the cost of serving ranges so high as to make the business less attractive.

2. Rewire the ranges so as to leave less possibility of unbalancing the three-wire circuit. Manufacturers have already given considerable attention to this matter, but it is impossible to get a well-balanced load under all operating conditions.

3. Wind the elements for 220-volt, two-wire service. This would involve complications in switches, greater hazard to the user, smaller and less substantial wire in the heating elements, but would insure a perfect balance of the circuit and prevent the theft of energy by backing up a fuse.

4. Install a small three-wire auto-transformer on the range side of the meter. Two service wires only from the main would be required. The advantage of 220-volt transmission would be obtained and there would be no unbalance on the general three-wire system. The cost of the auto-transformer installation would probably be borne by the customer, either as a direct charge or as reflected in the rate for energy. A disadvantage of this scheme is that it might in many cases be difficult to find a suitable location for the auto-transformer, and therefore the cost might be excessive.

5. Install a small three-wire auto-transformer as an integral part of the range. This would increase the cost of the range by about $15, but would balance the load at the point where the unbalancing occurs; would require but two service wires to the range, and the use of a two-pole instead of a three-pole entrance switch, a two-wire instead of a three-wire meter; would prevent the theft of energy, and would insure good voltage to the heating elements regardless of the method of operating the range. Naturally the design of the transformer must be such that the core loss is insignificant, or else a suitable switch must be provided to disconnect the transformer when the range is not being used.

6. Install a small three-wire auto-transformer on the pole off which the range service wires are taken. The connection from this point on would be the same as if no auto-transformer were used. This method has the disadvantage of increasing the cost of supplying service to range consumers, although in most cases it is preferable and more economical than either running heavier copper or installing a special transformer for each range.

It is evident that the scheme proposed under "5" above is to be preferred as being the most direct solution of the problem, and it is therefore recommended for the consideration of manufacturers and the industry in general. Until such time, however, as the manufacturers can be prevailed upon to adopt this construction operating companies will have to content themselves with one of the other methods suggested above. The one described under "6"—i.e., installing an auto-transformer on the pole off which the range service wires are taken—is probably to be preferred. Several large companies, notably the Portland (Ore.) Railway, Light & Power

Company, have been following this practice for some time with satisfactory results. The use of autotransformers for this purpose was described in the issue of the ELECTRICAL WORLD for March 11, 1922, page 487.

High-Speed Graphic Meter for Measuring Demands

BY L. D. SNOW
Service Division, Puget Sound Power & Light Company, Seattle, Wash.

ALTHOUGH theoretically graphic wattmeters will indicate the power passing through them at each instant of time, it is difficult on fluctuating loads to determine accurately the demand over a period of several minutes. This is due to the fact that each successive change in load produces a swing of the graphic pen, with the result that the chart shows a wide jagged band of ink. Such a record, while giving an idea of the use of power, is very difficult to average for any interval of time required in determining a demand. By speeding up the chart and drawing out these swings the impulses of power will show characteristics in themselves. It would appear from the record of a small section on a low-speed chart that the average power for that period would be a line drawn through the center of the wide band. Such a reading would likely be incorrect. A study of a high-speed chart record for the same load would give a better idea of the characteristics of the load and enable one to make a more intelligent and accurate reading. The Puget Sound Power & Light Company has converted an ordinary low-speed graphic watt-

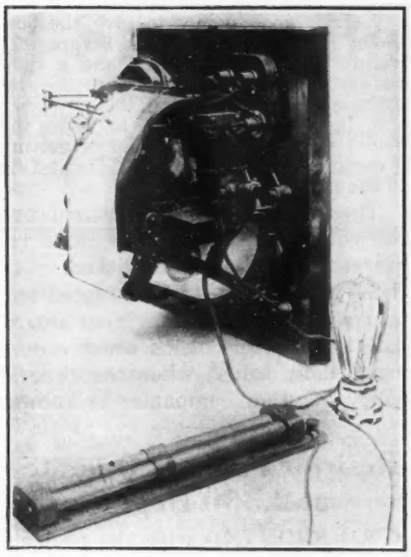


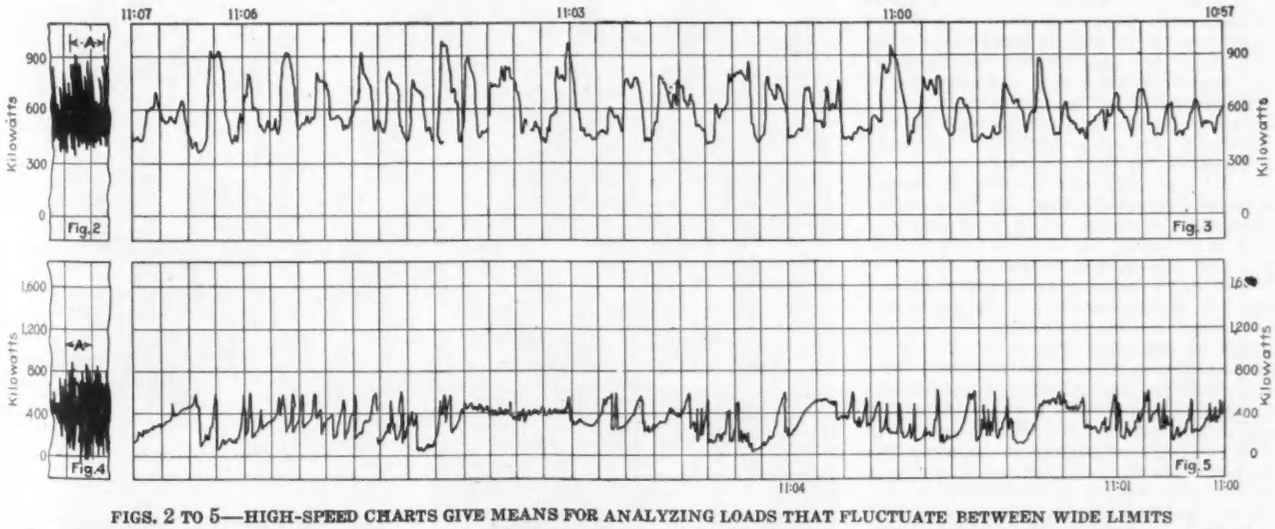
FIG. 1—MOTOR USED FOR DRIVING CHART AT SPEEDS VARYING FROM 3 IN. PER HOUR TO 2 IN. PER MINUTE

meter into a high-speed meter by substituting for the clockwork in the instrument a small series motor as shown in Fig. 1.

This motor runs at a very high speed and drives the mechanism of the instrument through a train of gears taken from an ordinary watt-hour meter. The speed is controlled by use of an incandescent lamp and an adjustable resistance in series with the motor, which is energized from a 110-volt circuit. Any number of speeds can be obtained by using gear trains of different ratios. The ratio used on the instrument described was 133⅓, giving a chart speed of 2 in. per minute. Fig. 2 is a chart taken from a low-speed graphic meter on a lumber-mill load. The chart travel is 3 in. per hour. The swings of the pen overlap one another, drawing a very irregular band from which it is difficult to obtain an average reading for any period of time. Fig. 3 is a chart taken at the same time on the high-speed meter. The chart travel in this case was 2 in. per minute. The moving element of the meter was heavily damped to prevent overshooting due to its momentum. The swings of the low-speed meter are here shown drawn out. From this it is evident that each swing represents actual power used by the mill and pictures clearly the power required as cuts are taken from the log by the head-saw.

Since the time of making a cut is longer than that required for the return of the carriage for the next cut, it is clear that the average reading is greater than a line drawn through the center of the irregular band on the low-speed chart. Fig. 3 and Fig. 4 are likewise low-speed and high-speed charts respectively taken on an electric furnace load. The high-speed chart shows that the impulses of power are very sudden and of short duration, causing the low-speed graphic to overshoot. The average power in this case would be less than a line drawn through the center of the wide band on the low-speed chart.

There are instruments on the market which are designed for high chart speeds, but where graphics of the low-speed class are available an arrangement of this kind can easily be made for speeding up the chart. Thus the expense of buying a special instrument, the use of which would be limited, is saved.



FIGS. 2 TO 5—HIGH-SPEED CHARTS GIVE MEANS FOR ANALYZING LOADS THAT FLUCTUATE BETWEEN WIDE LIMITS

Fig. 2—Graphic record from a lumber mill service. Chart speed 3 in. per hour.
Fig. 3—Graphic record from high-speed meter on lumber mill service covering same period shown by A in Fig. 2. Chart speed, 2 in. per minute, or forty times faster than that of low-speed meter, which gives an accurate record of the mill performance.
Fig. 4—Low-speed graphic record from an electric steel furnace load.
Fig. 5—High-speed record covering same period shown by A in Fig. 4.

Proper Inspection of Meter Wiring Important

BY W. C. DEVIN
Meter Department, Chester Valley Electric Company, Coatesville, Pa.

OF ALL the standardization rules of the central station no other is so vital as the one requiring that all wiring be in accordance with the National Electrical Code or at least passed by a competent inspector. A fire from defective electrical apparatus or wiring not only causes a financial loss to the property owner and possibly to his neighbor, but means a loss to the central-station company as well. Damage suits often result and a customer is lost, prospective customers are deterred and a public impression that electric wiring is hazardous is produced. The average person does not appreciate the danger of poor wiring, but every person appreciates the value of the dollar, so it naturally falls to the central station to set the standard for all electrical wiring to be connected to its lines.

Most companies require that a certificate be procured from the Fire Underwriters' Association before supplying service, while others depend upon a municipal inspector whose authority is supported by a city ordinance. With some companies the certificate of standard is not mandatory, a release being signed by the owner of the property instead.

To companies requiring an underwriter's certificate before supplying service many problems present themselves, especially when the rule has been in effect only a few years. Among these are:

1. Has the electric company a right to refuse to supply service to a house whose owner refuses to have the wiring inspected by the proper authorities, although it is not considered hazardous?
2. If additional wiring is done in the building whose original wiring is not standard, should a letter of approval be required on the new job?
3. If an additional outlet is placed in accordance with the code in a building with certified wiring, should the owner of same be required to obtain a certificate on this outlet?
4. What procedure should be followed when it is discovered that the customer has done a small amount of wiring which is safe but which has not been inspected?
5. Will the extra expense of having a small amount of wiring inspected cause the customer to do the work himself, possibly creating a hazard, instead of having a competent electrician do it, who knows a certificate is required on the job, no matter how small?
6. In a case where the electric service has been discontinued, should a certificate be required before reconnecting if the wiring has never been inspected and passed?
7. Is it good policy to give the customer temporary service before the wiring has been inspected and a temporary certificate issued by the inspector?
8. Is it good practice to have the owner sign a release instead of getting a certificate on his wiring? Is it fair to his next-door neighbor?

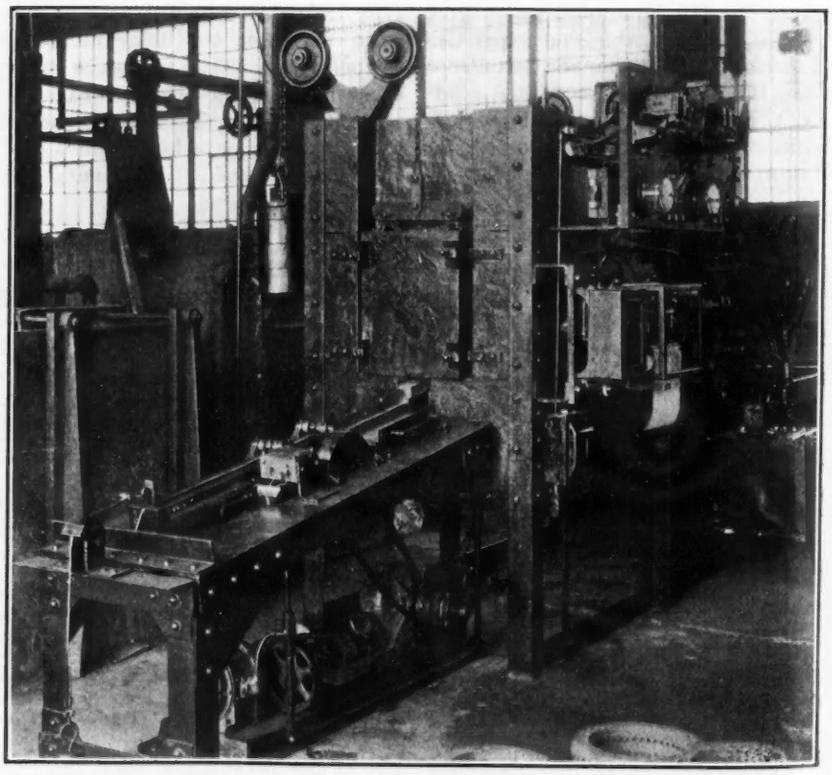
These questions do not concern the companies which have their requirements well established, but those which have lately enforced certain requirements for wiring almost daily confront problems which can be most easily solved when the general policy of other companies is known.

Resistor Furnace Operates at 2,350 Deg. F.

CONFRONTED with the problem of treating high-speed tools for automatic gear-cutting machines, the Gleason Works at Rochester, N. Y., installed a resistance-type furnace capable of heating the parts to a temperature of 2,350 deg. F. This furnace replaced an oil furnace from which the results had not been entirely satisfactory because of the variable heating conditions resulting in non-uniformity in the finished product, especially as to hardness.

Much research work was necessary before a resistor could be developed to withstand this temperature. The first experience with a solid graphite resistor showed that the electrode oxidized very quickly and usually burned out before the desired temperature had been reached. In working on the theory that some method would have to be devised to counteract the effect of oxidation on the heated electrode, F. J. Ryan & Company of Philadelphia, who furnished the furnace for this installation, designed a special low-voltage transformer with which the heat of the electrode could be increased to a much higher temperature. The temperature up to the working conditions of the furnace was reached easily, and it was found that after this temperature was reached the power input could be reduced to the original calculations of necessary input. As a result the high-power input is used only for bringing up the temperature and to overcome oxidizing conditions.

One of the advantages of this furnace is the fact that the tools are conveyed automatically through the furnace and are then extruded directly into the quenching bath. The heat of the tools entering the quenching bath causes fumes to be given off which have proved a direct benefit to both the electrode and the tools. The furnace consists of two chambers, the mean heating chamber in which metallic resistors are used and the final heating chamber in which the graphite resistor is used.



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Central Station Business

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An Appraisal of Employee Welfare Work

C. L. Edgar Cites Benefits in Accident Prevention, Co-operative Education and Development of Personnel—Value of Policy Demonstrated

ONE of the best estimates of the value of employee welfare activities was made by President C. L. Edgar of the Edison Electric Illuminating Company of Boston, before a thousand employees of that organization at a recent meeting called to celebrate prize awards for new business getting during the past year. The following extracts from Mr. Edgar's remarks indicate the attitude which the chief executive of the Boston company maintains in reference to employee welfare:

In the summer of 1910 the central-station companies took up seriously and systematically the question of relationship between employer and employee. From the very beginning our industry has been guided largely by the National Electric Light Association and its public policy committee, composed of the leading executives of the principal central stations in this country.

It was my good fortune to be chairman of the public policy committee in the year 1910, and we decided to confine our attention that year entirely to the question of relationship between employer and employee. The result was a report submitted at the convention in 1911 which has become an authority on this whole subject.

It was recommended as fundamental, first, that all of these activities should be at the expense of the company rather than at the expense of the individual employee, and second, that they should apply to all company employees from the office boy to the president. As a result of this report, our company made a complete study of the recommendations, and it is interesting to note that we have in force at the present time all of them with one or two exceptions.

Earlier Welfare Work at Boston

The Christmas tree of 1911 which was given to the families of our employees was, I think, the first tangible result of this new policy. It happened that about this time we were considering the construction of our Massachusetts Avenue service property, and the restaurant, recreation building, library building, tennis courts and ball field were also the direct result of this policy.

As soon thereafter as possible we organized our welfare bureau and put into effect our sickness and death benefits and our annuity benefits. In 1912 we held our first Edison field day, and we have kept it up as an annual institution ever since.

We started the Edison Savings Fund five years later, in 1917, and you may be surprised to know that up to date more than $1,000,000 has been deposited in this fund. Of course this does not mean that there is $1,000,000 there at present, as naturally a large percentage of it has been drawn out for various purposes; but it has resulted in our employees being able to save $1,000,000 out of their wages for future investments or expenditures.

Great Importance of Accident Prevention Work

I am not going to attempt to recite all of the welfare activities in which this company has been engaged, but there are two which it seems to me might well be emphasized. The most important of all is, in my opinion, the work of the company's accident prevention committee. This committee has been in existence since 1912. The superintendent of the employment bureau has acted as its permanent chairman, and the personnel has been changed from time to time in order to give all departments and all divisions a chance to become familiar with the work of the committee.

The company has been intensely interested in this subject of safety first from the beginning and has during all these years had a representative on the accident prevention committee of the National Electric Light Association and of the New England Division of the National Electric Light Association. The company is also affiliated with the National Safety Council and its local branch, the Massachusetts Safety Council. It has been represented on the executive committee of the National Safety Council, and one of our employees is at present chairman of the Public Utilities Section of that council, which includes more than two hundred public utilities.

In addition to the accident prevention committee itself, we have this year nearly one hundred departmental safety men appointed by department heads to report on unsafe conditions and unsafe practices. The result of all this is that our accident experience as a whole is considerably better than the average.

Educational Program Expanding

The other matter to which I want to refer specifically is the general question of the education program for the benefit of our own people. We have for many years had a reciprocal arrangement with a number of the educational institutions in our vicinity under which we take students for certain specified times during the year and give them a chance to learn our business. The work which they do while with us is considered a part of their regular college course, and they are rated in accordance with the thoroughness with which they undertake the work. For example, we have at the present time four men from Harvard, twelve from the Massachusetts Institute of Technology and a number from the Northeastern University. This arrangement has worked splendidly and has enabled us to get in touch with college men and be in a position to know something about their qualifications when they graduate. It has, of course, at the same time been of great advantage to the colleges themselves.

For some years our employees have been enabled to take advantage of courses arranged for by the National Electric Light Association. We have now decided that the time has come when we should go one step further and arrange to provide some of these educational advantages ourselves. I have, therefore, within very recent time, appointed an educational committee of representative men and women in the various departments, under the chairmanship of E. S. Mansfield. Plans are now being made, and it is expected that notices will be sent out within the next few weeks offering various educational courses, to start soon after the beginning of the new year.

Employee Welfare Work Its Own Justification

The question may well be asked, what is to be gained by all this? The public policy committee, in making its report, referred specifically to the question whether these activities were justified and whether they would be misunderstood. Our industry is in a little different position from the ordinary commercial corporation. We are a public utility, operating under a virtual monopoly, and our income is derived entirely from our customers. The question as to whether or not we were justified in spending our money for matters of this kind and including it in the cost of service was discussed at considerable length. Fear was expressed that public authorities might think that we were going too far, but it was finally concluded that the justification for all of these activities was so apparent that we had better go ahead and meet the criticism if it arose. Looking back over the last twelve years, we can see that this fear was groundless. While there has been individual criticism both from authorities and from employees, generally speaking, the plans have met with universal commendation.

I think the whole matter hinges very largely upon the spirit in which these things are done. So far as our own company is concerned, we have carried on these activities because we thought they were right and that our employees

were entitled, as men and women, to such consideration as we were able to give them. To my mind the greatest asset any company can possibly have is a satisfied and loyal body of employees. I feel that this condition exists in our company to the fullest extent. I do not want to claim that it is due to these various things which we have done, but at the same time I feel that they undoubtedly have helped.

There has been a lot of discussion as to the problems between employer and employees. These problems undoubtedly exist in certain industries and in certain corporations. If they have ever existed in our company, I have a feeling that we have solved them. We certainly have solved them to the satisfaction of the employer, and we trust also to the satisfaction of the employee.

Appliance Exhibit at Holding Company Offices

BETTER to acquaint members of the executive office staff with the "feel" and characteristics of a variety of modern electrical appliances a three-day exhibit was recently held at the headquarters of Charles H. Tenney & Company in Boston. The plan was devised by Cyrus Barnes, general sales manager of the Tenney organization, in the belief that many employees would be interested to obtain a closer firsthand acquaintance with electrical conveniences than can ordinarily be had in an office in the banking district of a large city. Orders were taken for holiday gift purposes by the purchasing department of the company, and nearly the entire personnel of the home office of this syndicate availed itself of the opportunity.

DISPLAY FAMILIARIZES HOLDING COMPANY EXECUTIVES WITH MERITS OF ELECTRICAL APPLIANCES

Finding a Name for "Convenience Outlet"

Philadelphia Electric Company Holds Competition in Which 2,829 Customers Express Opinion—Advertising Value Capitalized

BY CLARA H. ZILLESSEN

THE electrical industry wants a better name for what is pretty generally called a "convenience outlet." The name was adopted and has been extensively advertised, but somehow or other it has not taken hold as universally and wholeheartedly among electrical people as might be desired. It has been pushed more or less sporadically here and there, but to the public generally it has little significance. It is generally felt that the name is inadequate and that some term should be devised that will indicate clearly the conventional places where electrical appliances may be connected so that the public will understand and use the name and the whole industry will adopt it.

It occurred to us here in Philadelphia recently to put this question of a proper name up to our customers and get their response. To be perfectly frank, we did not set out with the expectation of getting a name which would immediately take the industry and nation by storm; but we did feel that it would be a good thing to "feel out" the public and see by what term they were calling this nameless orphan of the electrical industry. Moreover, we felt it would be good local advertising, and that it would stir up an interest in more outlets per house.

It was rather a difficult matter to put before our public. On thinking it over we decided to run a couple of pages in our quarterly house organ for residential customers, explain the situation, offer prizes for the best names, and then sit back and wait for the returns. It was a wide-open contest with no limiting rules—each contestant could send in as many name suggestions as desired. The closing date was the only limitation.

We offered three prizes—First, a lamp valued at $25; second, a waffle iron; third, a grill or percolator. Then, to sustain the interest, we offered as "extra special prizes" for the ten next best names ten double-duty plugs. We expected to receive several hundred replies and thought it would be a simple matter to pick the prize winners from them.

As a matter of fact, the replies actually totaled 2,829. A lot of them were valueless, of course—humorous, "near-humorous," foolish and impossible. Out of the whole lot we picked fifty names which might be considered as coming somewhere near hitting the mark. It is interesting to note that of the total number only fourteen replies suggested the term "convenience outlet." The word "socket" seemed to be much better known than "outlet," as is evidenced by the fact that 468 individuals used the word "socket" and only 235 used "outlet."

Another interesting point is that seventy-five suggestions coupled the word "utility" with either "socket" or "outlet," and 54 suggestions coupled "service" with the same two terms. It is well to consider this, because when the word "utility" was suggested at one time as a proper term a number of people in the industry claimed that the public would confuse the adjective "utility" with "public utility" or "public service." This apparently does not seem to be the case.

We sent these names to a number of people in the electrical industry who have been working for the best nomenclature and to a number of men and women—not connected with the electrical business in any way—

who might be expected to make reasonably intelligent selections. We gathered together their replies and finally selected the winning names, making the last choice somewhat on the same principle as that on which the All-American football team is selected. Here is the final result: First prize, "plug-in"; second prize, "electro tap"; third prize, "convenience socket"; ten extra prize-winning names, "handiplug," "service plug-in," "service socket," "handisocket," "service tap," "utility socket," "walsocket," "utility outlet," "appliance connection," "plug-in socket."

When the returns were all in we found that seven persons had won the first prize, five persons the second and eight persons the third. In addition, the ten extra prizes had been won by 143 people. There was nothing to do, however, but to give seven first prizes, five second prizes and eight third prizes, plus 143 extra prizes for the ten next best names.

So we wrote personal letters to each prize winner, telling them about the unexpectedly large returns and that we would give each prize winner a prize as advertised. In order to make capital out of this unforeseen circumstance, we have advertised the whole thing in the newspapers, first, to bring this extra-outlet proposition before the public in a new way; second, to build up additional good will; finally, to give as much publicity as possible to the new term.

Milwaukee Has High Appliance Saturation

Survey by Newspaper Indicates Widespread Use of Electrical Devices—Electric Washers Owned by 27 per Cent of City Families

AN APPLIANCE survey of Milwaukee just published, which was made under the direction of the Milwaukee *Journal*, indicates some interesting particulars concerning electrical appliance saturation in that city. The survey was conducted in conjunction with an analysis of other household utensils and accessories. More than 9,000 questionnaires were answered of the 40,000 distributed. This 22.5 per cent return served as the basis for estimating the saturation of the entire city. As an inducement to answer the questionnaires sent out a shopping bag filled with food and other household merchandise was given to each person who presented the questionnaire personally or by messenger to the merchandising service bureau of the Milwaukee *Journal*. The work was started in January, 1923, and it took ten statisticians four months to complete the survey.

Out of a total population of 539,449, 77.4 per cent of the families are reported as living in electrically wired homes. Of the total Greater Milwaukee families, 66,377, or 54.1 per cent of the 122,694 families investigated, are owners of one of three types of washing machines—electric, water-power and handpower. Of these, 33,250, or 50.1 per cent of all washing machines, are of the electric type. This represents a percentage of 27.1 of the total number of families.

Vacuum cleaners to the number of 62,819 machines are owned by 51.2 per cent of the families, about fifty types of machines being distributed in Milwaukee.

Only 1,840 Milwaukee families own electric ironing machines. This is less than 2 per cent of the total population. Electric flatiron saturation is much greater since 75.7 per cent of families own this appliance. Sixty-four different makes are in use. It was also found that 2,085 families having wired homes do not use electric irons.

The use of toasters is much lower, since only 29.2 per cent saturation is obtained. Products from fifty-two manufacturers were represented. A similar situation was found in the electric heater field, where 20.7 per cent of the population enjoy open-air heaters, twenty-four kinds being used.

Milwaukee has not gone far toward a saturation point for electric ranges, as only 0.86 per cent of the population use them. In the percolator field 12.6 per cent of the Greater Milwaukee families are provided with thirteen types of this appliance. Curling irons have a distribution of 17.1 per cent, twenty-nine varieties being employed. Only 9.1 per cent of the Greater Milwaukee families own electrical vibrators, numbering twenty-seven makes.

Detailed statistics were also developed to show the proportion in use of the devices of various manufacturers to determine the influence of local advertising upon the sale of electrical household appliances.

What Other Companies Are Doing

Boston, Mass.—In the first week of a campaign at Canton, Mass., the Edison Electric Illuminating Company of Boston sold 250 kitchen-lighting units, the total number of residence customers in the town being 800. Nine employee salesmen "worked" the territory under the general direction of Julius Daniels, illuminating engineer of the company. The unit used consists of a 9-in. "daylight" fixture, usually with a 100-watt lamp (a 150-watt lamp is offered as a choice). A thirty-day free trial is given and the unit sells installed for $7.50.

Spokane, Wash.—The Washington Water Power Company is cooperating with the local Electric Service League in the erection of ten illuminated poster boards, showing electrical appliances and bearing the legend "Electric Service for Christmas Gifts." These will be 25 ft. long and will be placed on the principal street-car lines. They will be on display for a month before Christmas. The Electric Service League is composed of jobbers, manufacturers, central-station companies and contractor-dealers.

Illinois. — Motion pictures are to be used in telling the story of the growth and development of the public utility properties under the management of the Illinois Power & Light Corporation. Pictures of the various properties and industries served will be taken in Illinois and Missouri. They will also show the manufacture of electric power and gas, beginning with the coal taken from the mines, and how energy is generated and distributed.

Des Moines, Iowa. — More than thirty women employees of the Des Moines Electric Company met recently to form an organization for the study of public utility problems. The women will assist the organization in efforts constantly being made to improve service and acquaint the public with information regarding electrical service. Miss Celeste Robinson presided at the meeting, and short talks were made by M. C. Linn, general manager of the company; Miss Isabelle Davie, chairman of the women's public information committee of the Middle West Division of the N. E. L. A., and Joe Carmichael, director of the Iowa Committee on Public Utility Information.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

Steam-Turbine Blading.—J. C. READ.—The author first describes the causes and effects of corrosion and erosion and then deals with the form of the blade passage in impulse and reaction machines and with the energy losses occurring in the blading. He then details the stresses in the blades and describes the type of blade fastenings, lacing and shrouding, gives methods for obtaining a large exhaust area, and finally deals with vibration and its causes, showing a method of correcting for the effect of centrifugal force.—*Journal of (British) Institution of Electrical Engineers*, October, 1923.

Power Station at Forshuvudsforsen, Dalälven, Sweden.—CAPT. MAURITZ SERRANDER.—This article is a complete description of the new power station on the Dalälven in Sweden built by Stora Kopparbergs Aktiebolag. The station is arranged for three units, each of 8,000 hp., two of which are already in operation. The waterwheels are constructed for 83⅓ r.p.m., at which they are warranted to have an efficiency of 86 per cent for a water consumption of 60 cu.m. per second. The generators are rated at 6,500 kva., 11,000 volts and 50 cycles.—*Teknisk Tidskrift (Swedish)*, Oct. 27, 1923.

European Development in High-Speed Hydraulic Turbines. — ELOV ENGLESSON.—The Kaplan-type turbines are designed with movable blades to be adjusted for different load conditions, which improve the part-load efficiencies. An 11,200-hp. turbine of this type is being constructed to operate under 21.25 ft. head and run at 62.5 r.p.m. The runner is 19 ft. in diameter and weighs 62.5 tons.—*Power*, Nov. 13, 1923.

Sherman Island Hydro-Electric Development.—A 50,000-hp. development on the Hudson River, consisting of five 10,000-hp. vertical Francis turbines to operate under 66-ft. head, has recently been placed in operation. The power house and canal are constructed on sand underlain in many cases with quicksand. The dam rests on glacial deposits and is of special construction and the canal, over 3,500 ft. long, is concrete-lined. Structural-steel framework was used to reinforce draft-tube bells. Provisions have been made for continuously measuring the flow of water to each unit.—*General Electric Review*, December, 1923.

Determination of the Fineness of Powdered Coal.—W. A. SELVIG and W. L. PARKER.—Coal being usually pulverized so that 70 per cent or more passes through a 200-mesh sieve, it presents difficulties in sieving as the finely divided material tends to clog the meshes. Recognizing this condition the Bureau of Mines, through co-operation with the committee D-5 on coal and coke of the American Society for Testing Materials, conducted sieving tests on two standard samples of powdered coal, the tests being described in this paper. As a result of this work a method for making fineness tests, by hand sieving, is recommended as a standard method, while a rapid method, by machine sieving, is given for routine tests.—*Report of Investigations, No. 2545, Bureau of Mines.*

Generation, Control, Switching and Protection

Overloads and Short-Time Ratings.—R. O. KAPP.—In connection with the generation of energy a problem often arises as to what period of time under given conditions a plant will safely stand a given overload. If sufficient design data of the plant are known, the problem may be solved and a result can be arrived at by calculation, but the calculation involves expensive mathematical studies and is generally too complicated to be found worth while. A simple graphical solution in this case would be of help. Such a graphical solution is given applicable to transformers and cables.—*Electrical Review (England)*, Nov. 2, 1923.

Outdoor Oil Breakers for 44,000 Volts.—A short article on the design and important characteristics of an oil circuit breaker recently developed in England. The breaker is of very rugged construction, making it suitable for very heavy-duty service.—*Electrician (England)*, Nov. 9, 1923.

Overload Protective Relay.—A. B. CAMPBELL.—Several types of thermal and temperature overload relays recently developed are described. After a few remarks on the general principles involved, the author describes the construction and operations of these relays.—*General Electric Review*, December, 1923.

Transmission, Substations and Distribution

Inter-Scandinavian Power Distribution.—A. ANGELO.—This paper, read at the Electrotechnical Congress in Gothenburg, Sweden, in 1923, gives the results of the work of a Scandinavian committee appointed in 1921 to investigate the project. The author discusses the financial and technical problems in connection with a superpower system extending over Sweden, Norway and Denmark. The main problem is the transmission of power from Norway and Sweden to Denmark. The different possibilities of undersea cables between Norway and Denmark and between Sweden and Denmark are considered. Alternating current cannot be considered for the former project on account of the extensive net of telephone and telegraph cables in Skagerrak. The committee has established four main alternatives for the superpower system, and gives a detailed description of each. These alternatives are: (1) Direct-current power carried in undersea cables under Skagerrak between Norway and Denmark; (2) direct-current power carried in overground lines through Sweden and across Oresund; (3) alternating-current power carried in overground lines through Sweden and through an undersea cable across Oresund; (4) alternating-current power carried in overground lines through Sweden and an overground line across Oresund.—*Teknisk Tidskrift (Swedish)*, *Elektroteknik*, Oct. 6, 1923.

Effect of Shearing Stress on the Span Calculations of a Suspended Cable.—T. OHTSUKI.—The paper presents the complete equation of a suspended cable, taking into account its density, elasticity and rigidity, and determines the extent to which the effect of shearing stress should be considered for practical span calculations.—*Journal of (British) Institution of Electrical Engineers*, October, 1923.

Mechanical-Electrical Construction of Modern Power Transmission Lines.—C. B. CARLSON and W. R. BATTEY.—An abstract of this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. fall convention, Oct. 20, 1923, on page 801.—*Journal of A. I. E. E.*, November, 1923.

Units, Measurements and Instruments

Temperature Measurement with the Einthoven Galvanometer. — F. ADCOCK and E. H. WELLS.—The object of this investigation is to study the relationship between the temperature of the gas in which the thermometer is situated and the thermometric record obtained. Attention has been devoted primarily to the platinum-resistance thermometer. As it is required to obtain a continuous record of temperature throughout a single cycle, the method adopted is to measure the out-of-balance current in the Wheatstone bridge by means of an Einthoven galvanometer. The forces on the fiber of the Einthoven galvanometer are considered and the suitability of various types of fiber are compared. The apparatus designed to investigate the problem is described. Experimental results are given and discussed.—*Journal of (British) Institution of Electrical Engineers*, October, 1923.

Measuring Small Currents.—An instrument is described for use in connection with the compensation method of measuring currents of 10^{-9} amp. or less. It consists essentially of a current divider, which divides a variable current in a ratio very large compared

with unity. The small current is used for compensating the unknown current, the large current is read on a relatively insensitive instrument. The device consists of a thermionic cathode and an anode pierced by a small hole. The large current is that received by the anode; the small current is the fraction passing through the small hole in the anode.—*Journal of Scientific Instruments* (*England*), November, 1923.

Illumination

Railway Car Lighting.—G. E. HULSE.—The author discusses the limitations encountered in supplying illumination to cars. The amount of energy available is limited owing to the car being on the move. The position of lighting fixtures is determined by car construction, preventing flexibility in placing units. Maintenance of reflecting and transmitting surfaces is more difficult than in most other situations. Arrangements of fixtures for various types of cars, the resulting illumination, the type of glassware used and the efficiency of installation with this glassware are considered.—*Transactions of I. E. S.*, October, 1923.

Illumination by Light Projectors at Coal Mines.—EDGAR GEALY.—Hazards of poor lighting, the function of reflectors and methods of focusing the headlights of mine locomotives are discussed. Present practice shows that there is a great need for the application of the advanced principles in correct illumination in coal mines.—*Coal Age*, Nov. 29, 1923.

Motors and Control

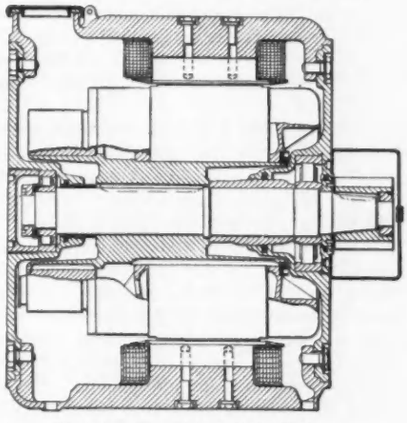
Power and Electrification in Finland.—G. M. NORDENSVAN.—This paper was read at the Electrotechnical Congress in Gothenburg, Sweden, 1923. The author gives the consumption of power, both electrical and mechanical, in Finland and shows how it is distributed throughout the domestic, industrial and railway fields. The available water power is able to generate an average of 2,500,000 hp. The electrification of railroads has been considered from time to time by several committees, but nothing has been done as yet. The total length of railroads in Finland amounts to about 4,000 km., of which about 350 km. is being considered for electrification. The total consumption of energy for this electrification would amount to about 30,000,000 kw.-hr. per year.—*Teknisk Tidskrift* (*Swedish*), *Elektroteknik*, Oct. 6, 1923.

Calculation of Air-Space Flux.—W. CRAMP.—With the increase of alternating-current apparatus and the spread of wireless telegraphy, the calculation of air-space flux, whether electromagnetic or electrostatic, becomes daily of greater importance. At present the formulas of Forbes are used, supplemented by certain cases developed by Maxwell, Thompson, Carter and others. The author extends the number of these cases and develops therefrom close approximations in forms of immediate use to the designer. The results thus obtained are compared with the older formulas by means of examples.—*Journal of* (*British*) *Institution of Electrical Engineers*, October, 1923.

Speed Regulation of Strip and Bar Mills.—In addition to the usual characteristics required for mill motors generally, it is essential also with motors for these mills that when adjusted for any definite speed throughout the range of control the speed should be only slightly affected by wide variations in load. The motors should also be able to carry high overloads throughout the full speed range. This article discusses the essentials of alternating-current motor design, rating of mill motors, function of regulating set, ohmic drop exciter, necessary control equipment and speed-control arrangements.—*Electrician* (*England*), Nov. 30, 1923.

Traction

Roller Bearings for Traction Motors.—H. MECKE.—The author shows some of the latest bearing constructions which have been found successful on railway motors. Where 20-kw. motor



MODERN TRACTION MOTOR WITH ROLLER BEARINGS

rating is not exceeded ball bearings are recommended. Above this size smaller dimensions and more competitive cost will result from the use of roller bearings. For motors which are to be installed in cramped places, as on narrow-gage cars or in mine locomotives, well-designed roller bearings, extending on both sides deeply into the hollowed-out armature body, give the designer a chance to compress a comparatively large-size motor into the smallest available width, as, for example, in the design shown here.—*A. E. G. Mitteilungen*, September, 1923.

Heat Applications and Material Handling

Electric Furnace Progress.—W. S. GIFFORD.—The total capacity of the electric furnaces in Sheffield, England, at the end of the war was about 150,000 tons per annum. Since that time several new installations have been placed in operation. One of the important questions raised by the author is how developments in the iron and steel industry can be aided by the use of the electric furnace. Stainless iron, like stainless steel, should be a useful electric furnace application, especially as electric heating is economically the best method to employ. Another use of the electric furnace is for such processes as hardening, tempering and annealing, while the employment of the induction furnace in brass manufacture is extending.—*Electrician* (*England*), Nov. 30, 1923.

Improved Electric Melting Furnace for Alloys.—T. F. BAILY.—A description is given of the new type of radiant-dome electric furnace recently installed in the plant of the Miller Industries, Canton, Ohio. The furnace requirements of this plant are unusually severe, as its product requires a wide range of metals, running from yellow brass, bronze and red brass to alloys containing 50 per cent nickel. The operation of the furnace for these processes in this plant have been very satisfactory in the time it has been in operation.—*Chemical and Metallurgical Engineering*, Dec. 10, 1923.

Telegraphy, Telephony, Radio and Signals

Generation of Alternating Currents by Means of Triodes.—N. SHUTTLEWORTH.—The author covers the essential features of the subject and endeavors to solve some of the difficulties on original lines. He offers an explanation of the characteristic behavior of triodes in conjunction with generator circuits. After a brief study of the characteristics of a triode or high-vacuum valve provided with three electrodes, the general circuit is considered and the factors determining the frequency of the generated current are established. The design of a circuit to meet a specification is laid out and experimental confirmation is given. Finally a graphical method of analysis is evolved to show in diagrammatic form the conditions under which triodes may and do operate.—*Journal of* (*British*) *Institution of Electrical Engineers*, October, 1923.

European Long-Distance Telephony.—The problem of international long-distance telephony has become a subject of universal interest, to the study of which telephone engineers and executives throughout the world are giving their closest attention. The solution of this problem has been materially advanced by the work of the delegates composing the Preliminary Technical Committee for European Long-Distance Telephony at a meeting in Paris on March 12-20, 1923. Their recommendations, unanimously adopted, have been approved by the administration of the six countries involved, which are Belgium, Spain, France, Great Britain, Italy and Switzerland. Recommendations for transmission, aërial lines, cables, composite lines and traffic regulations are included in this report, which has been translated from the original French.—*Electrical Communication*, Vol. 2, No. 2.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

New Niagara Unit Cut In

Niagara Falls Power Company Starts Up "World's Biggest" Hydro Turbo-Generator

THIRTY-SEVEN prominent hydraulic and electrical engineers and central-station executives, as well as representatives of the federal government, assembled at the new power plant of the Niagara Falls Power Company on Tuesday, Dec. 18, to see Jacob F. Schoellkopf of Buffalo, chairman of the company's board of directors, start up what is so far the largest hydro-electric unit in the world.

This giant unit weighs more than 1,750 tons. It consists of a 70,000-hp. single-runner, vertical-shaft hydraulic turbine attached to an electric generator delivering 65,000 kva. at 12,000 volts. This is the first of three such units being installed in the new twelve-million-dollar project at Niagara. When completed this station will house units with a total rated capacity of 454,000 hp. The company has two other stations with rated capacities of more than 200,000 hp. The annual output of the American Niagara system is in excess of 2,500,000,000 kw.-hr. and represents about one-third of the electricity sold in New York State.

The new unit uses 3,200 cu.ft. of water per second with an efficiency of at least 93 per cent. It does not increase the company's diversion of water in any way, but does materially increase the efficiency of conversion into power. It uses the same amount of water formerly used by seven 5,000-hp. units and delivers energy equivalent to the output of fourteen such units. Each of the three new 70,000-hp. units will produce electricity which if generated through the use of coal would require 700,000 tons annually. The new installation will produce an increase of 100,000 hp. of electricity.

BIGGEST WATERWHEEL EVER BUILT

The turbine of this unit is the biggest waterwheel in power capacity ever built. It is a product of the I. P. Morris Division of the Cramp Ship & Engine Building Company of Philadelphia. The runner is a single-piece s' el casting weighing 105,000 lb. The turbine casing and control valve required thirty-two carloads of parts. The stator of the generator weighs 228 tons. The rotor with its twenty-eight 8-ton poles measures 21 ft. in diameter and weighs 399 tons. The revolving elements, consisting of rotor, shaft and runner, total approximately 500 tons and are suspended from the top of the unit by a Kingsbury thrust bearing. The generator was manufactured at the Schenectady works of the General Electric Company, where a companion machine is approaching completion. One hundred and ten cars were required to transport the machinery and equipment composing this unit.

THE PRESSURE TUNNEL

The three new hydro-electric units will receive their supply of water through a new hydraulic pressure tunnel. This tube, which is 32 ft. by 32 ft. in diameter and 4,300 ft. in length, carries the water from the head of the rapids above the falls under the city of Niagara Falls to the edge of the high cliff below the falls. It was excavated through solid rock. The tunnel discharges into a great forebay from which the water is conducted to the turbines by means of three 21-ft.-slope tunnel penstocks cut through the limestone cliff.

"Two million people will share in the increased power produced by this project," said Paul A. Schoellkopf, president of the Niagara Falls Power Company. "It means more power for Buffalo and for all on the Niagara frontier. However, in spite of the additional energy from this new unit, as well as the energy to be produced by the other two big machines which go into service during the coming year, the demand for cheap, constant hydro-electric power from Niagara outruns the supply. We cannot augment our output, after the completion of this project, until present restrictions on the use of the waters of the Niagara River are modified."

Bill Leasing Muscle Shoals to Ford Strongly Backed

Much significance is attached at Washington to the Muscle Shoals bill which has been introduced by Representative Dickinson of Iowa. It is understood that the bill was drafted in official quarters and that it has powerful support in Congress. It proposes to lease the government's Muscle Shoals properties to Henry Ford under conditions which would bring the entire operations under the provisions of the water-power act. The measure provides that the government is to receive an annual return of 6 per cent on its actual expense of constructing the dam and other project works, exclusive of navigation facilities, with the proviso that only 3 per cent need be paid for that proportion of the facilities used in the production of commercial fertilizers.

New Station in Des Moines

Illinois Power & Light Plans to Build Steam Plant with Ultimate Rating of 200,000 Hp.

PLANS for the building of a steam generating electric power station for the Des Moines (Iowa) Electric Company, with an ultimate capacity of more than 200,000 hp. and to cost more than $16,000,000, were announced at Chicago this week by the Illinois Power & Light Corporation. This is the largest improvement announced by that company since its organization last summer. It will be, the company's officials say, one of the many to be made from time to time in the corporation's plans for betterments and expansion of service.

Work on the first section of the plant, consisting of two units of 33,500 hp. each, to cost together $6,000,000, will begin at once and will be pushed to completion as rapidly as possible. The power house, which will be built on 63 acres of land near the southeast city limits of Des Moines, below the junction of the Des Moines and Raccoon Rivers, will be thoroughly modern in construction. When it is finished the old power house will be used as a standby station.

Hartford Company Will Manage Connecticut Power

Effective Jan. 1, 1924, the Hartford (Conn.) Electric Light Company will take over the management of the various divisions of the Connecticut Power Company from Stone & Webster, Inc., Boston. The Hartford company purchased a controlling interest in the Connecticut Power Company a few years ago. Under the new arrangement a closer co-ordination of the systems involved will probably take place along both engineering and commercial lines. No present changes in executive personnel are contemplated. V. E. Bird is general manager of the Connecticut Power Company, with headquarters at New London.

Commonwealth Edison Sells $15,000,000 of Bonds

An issue of $15,000,000 of first mortgage collateral 5 per cent gold bonds of the Commonwealth Edison Company of Chicago, series A, due in 1953, was made this week by Halsey, Stuart & Company. When the books were opened on Wednesday it was found that advance subscriptions received had exceeded the amount of bonds offered.

The bonds are priced at 92½, to yield more than 5.50 per cent. These bonds constitute the initial issue under a mortgage of July 1, 1923.

Big Mine Electrification

Susquehanna Company's Four Anthracite Collieries in Pennsylvania to Be Converted

THE Susquehanna Collieries Company has under way an extensive electrification program which will, it expects, be completed within a year. According to the company's plans, all its four mines in the Shamokin district will be operated with electric power. This will go far to revolutionize the coal industry in the anthracite region of Pennsylvania. The Richards and Pennsylvania collieries will be operated by electricity within six months, and within a year the Cameron and Luke Fidler collieries will have the same motive power, insuring both greater efficiency and better and safer working conditions.

The Richards Colliery is already being operated electrically so far as the shafts, pumps and compressors are concerned. At this colliery there are eleven slopes, the breaker, the compressor and two fans, all of which will be driven by electricity. At the Cameron and Luke Fidler collieries there are one shaft, more than five slopes and two larger breakers to be electrified, and at the Pennsylvania Colliery six slopes, three inside and three outside, will be operated by electricity.

It was rumored that the power plant, erected at cost of approximately $1,200,000, would be abandoned because of the proximity of the new substation of the Pennsylvania Power & Light Company at Harwood, but this statement is unfounded. With the new system of operating the collieries, the coal company will save enough within ten years to pay for the construction of the power plant.

With only half of the generating capacity in operation, the monthly output of the plant is 1,500,000 kw. When the four collieries are electrified the services of more than a hundred men in boiler houses will be dispensed with, thereby saving $5,500 on the monthly payroll. Only thirty-two men will be required to operate the electric power plant. One boiler will continue to be operated at each of the collieries for heating purposes.

Effect of Home Rule Amendment in New York State

The effect on public utility companies of the home rule amendment to the New York State Constitution passed in November is the subject of some speculation at Albany, and it is predicted that the cities which do not now have the right to own and operate public utilities will endeavor to get this right from the Legislature so that all municipalities in the state may be placed on an equal footing.

The cities which, either by a provision in their charter or by special law, now have the right to own and operate municipal electric light plants, supplying their citizens as well as furnishing lighting for the streets and public buildings, are Binghamton, Jamestown, Watertown, Oswego, Dunkirk, Batavia, North Tonawanda, Tonawanda, Port Jervis, Rome, Salamanca, Long Beach and Oneida. Of these only Long Beach, Jamestown, Salamanca and Dunkirk are taking advantage of the right. Batavia did operate a plant for some time and then accepted service from the Niagara Falls Power Company at a lower rate. The city can resume operation of its own plant at any time. All villages can by present law own and operate their own lighting plants, and seven or eight do so. The larger cities in the state have the right to own and operate plants for municipal lighting only, and the Legislature would have to act before they could engage in selling light and power.

Twelve Big Power Plants Are Under Way in One State

It is probable that Pennsylvania leads all the other states in the amount of steam generating capacity now being installed. Nine large steam plants, as well as three hydro-electric plants, are listed by the Pennsylvania Public Service Information Bureau as under construction or almost completed in that state. Nearly all of them are designed to be in operation by the end of 1924.

The nine steam plants include the 25,000-kva. station of the Penn Central Light & Power Company at Saxton, whose opening was noticed in these columns last week; the 50,000-kva. station of the Counties Gas & Electric Company at Norristown, the 70,000-kva. extension of the Duquesne Light Company at Colfax, the East Penn Electric Company's 50,000-kva. plant at Pine Grove, the Metropolitan Edison Company's 30,000-kva. station at Middletown, the West Penn Power Company's extensions at Springdale, bringing its initial output to 70,000 kva., and the three big installations of the Philadelphia Electric Company—the new station to be built at Erie Avenue with an initial rating of 200,000 kva., the nearly finished station at Penn Treaty Park, to begin with 60,000 kva., and next year to add another 30,000 kva. and the Chester station extension of 60,000 kva.

The three hydro-electric plants are the Hawley plant of the Pennsylvania Power & Light Company, rated at 50,000 kva.; the Clarion River station of the Pennsylvania Public Service Corporation, rated initially at 25,000 kva., and the Pennsylvania Water & Power Company's extensions at Holtwood, rated at 40,000 kva.

The Pennsylvania Public Service Information Bureau puts the ultimate capacity of these twelve installations at 2,120,000 kva.

To Enter Latin-American Field

Electric Bond & Share Company Organizes the American & Foreign Power Company to Carry on Electrical Utilities in Cuba, Central and South America

WITH an authorized capital of 400,000 shares of preferred stock, 120,000 shares of second preferred and 1,500,000 shares of common, all without par value—the capitalization totaling, however, not less than $50,000,000—the American & Foreign Power Company has been incorporated in Maine to enter the public utility field in Cuba, Central America and South America. This organization has been formed by the Electric Bond & Share Company, the common stock of which is owned by the General Electric Company. It marks the entrance for the first time on a large scale of American capital and enterprise into the field open to the electrical industry in Latin America.

The American & Foreign Power Company, Inc., will immediately take over the important public utility properties in Cuba, Panama and Central America now owned by the Electric Bond & Share Company and will acquire additional foreign public utility properties which for some time have been under investigation and study. It is planned to have the new company carry on the same program in foreign countries as the Electric Bond & Share Company has carried on in this country and which has resulted in the success of such companies as the American Power & Light Company, the American Gas & Electric Company, the Carolina Power & Light Company and other associated companies.

The president of the new company will be Sidney Z. Mitchell, who is also president of the Electric Bond & Share Company, and the following will be directors: Owen D. Young, chairman of the directors of the General Electric Company; Anson W. Burchard, president of the International General Electric Company; Clarence Dillon of Dillon, Read & Company, and Charles E. Mitchell, president National City Bank.

Financing of the project, it is understood, will entail the selling of substantial amounts of stock in the European markets, although the major amount will be raised in New York. As a start it was announced that the Electric Bond & Share Company would purchase for cash the 120,000 second preferred shares and a majority interest in the common.

There are now associated with the Electric Bond & Share Company more than 100 public utility companies in the United States, which serve a total population of about 7,200,000. These associated companies represent an invested capital in excess of $650,000,000. The transfer of the foreign properties now owned will put the American & Foreign Power Company, Inc., into im-

mediate operation and give it a substantial return.

LARGER PROFITS POSSIBLE

The announcement was accompanied by the following statement prepared by E. B. Lee, statistician of the Electric Bond & Share Company: "It is interesting to note that while Canadian, British, German and South American capital has been heretofore heavily invested in public utility properties in foreign fields practically no American capital, except that represented by the investments of the Electric Bond & Share Company, has been invested in such enterprises. This is true notwithstanding that public utilities have been developed to a much higher degree in the United States than in any other country, and accordingly operators of public utility properties in America should have the experience to make them highly successful in foreign fields.

"The present is considered a most opportune time for the formation of an enterprise such as the American Foreign Power Company, Inc., as many foreign exchanges are depreciated, making it possible for the new company, with its large available capital, to acquire properties at low prices.

"It is understood that financial returns obtainable from public utility companies in foreign countries are much larger than in the United States. In fact the Electric Bond & Share Company expects these foreign utility investments to yield an average return perhaps twice as much as is possible in this country."

Two Stone & Webster Utilities to Expend $1,845,000

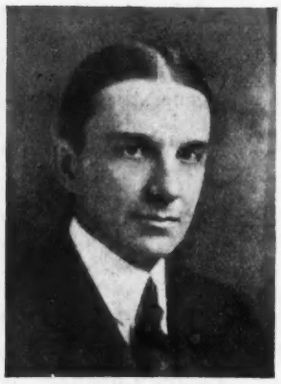
Contracts have been awarded by Stone & Webster, Inc., Boston, for important enlargements of central-station generating plant and allied facilities on the systems of the Edison Electric Illuminating Company of Brockton, Mass., and of the Puget Sound Power & Light Company, Seattle. At the East Bridgewater steam plant of the Brockton company two 588-hp. boilers will be installed, with oil-burning equipment adequate for six boilers; a 10,000-bbl. oil-storage tank, concrete service tank, pumping equipment and heaters. The contract also includes the rearrangement of the present switching equipment. A 13,200-volt line 4 miles long is to be built from the station to Dupont Circle, Brockton, where a two-story switch house, transformer and switching equipment will be installed to tie the system into the transmission lines to be built to the Montaup Electric Company's plant at Fall River, Mass. The estimated cost of this work is $785,000.

On the Puget Sound system a fourth unit, consisting of a 20,000-kva. generator and a 23,000-hp. waterwheel to operate under 440-ft. head, is to be installed, with a new steel penstock 1,800 ft. long, building extension, transformer and switching equipment, at an estimated cost of $1,060,000.

Coolidge Appoints Young

Chairman of General Electric Board to Be One of American Experts to Serve in Germany

IN RECEIVING from President Coolidge an appointment, in association with General Charles G. Dawes and a third expert still to be named, to represent the United States on the two international committees designated by the Reparations Commission to investigate the German financial and economic problem, Owen D. Young, chairman of the board of the General Electric Company, has become a figure of world-wide importance. As the successor of Charles A. Coffin in the great manufacturing company that the latter had done so much to build up Mr. Young was already a conspicuous figure in American financial and industrial circles. He is one of a very few men who may be said to dominate electrical



O. D. YOUNG

manufacture in the United States. Though his education and training were those of a lawyer, his great ability in corporate organization has had its best manifestation in the industry that has been built up on Edison's invention of the incandescent lamp.

For ten years previous to his elevation to the head of the board Mr. Young was a vice-president of the General Electric Company and at the head of its legal department. Previously he had numbered among his clients Stone & Webster, the Boston engineering firm so largely interested in electrical undertakings, and in their interest had traveled over a great part of the country. His rapid advancement in his chosen profession and the placing of the General Electric's legal department in his hands when he was thirty-eight years of age establish his legal ability on an unquestionable foundation which needs no further words.

RADIO CORPORATION HIS WORK

To him is ascribed the creation of the Radio Corporation of America, of which he became and is chairman of the board. Whatever view may be held of the monopolistic features of this body, no one can deny the acumen and ability displayed in reconciling conflicting interests and manufacturing rivalries and in thus building up an organization that has placed America in the van in the development not only of national but of international radio. Marconi will ever remain the pioneer of wireless transmission of signals and speech, but the fact that in the United States this epoch-making discovery has within a comparatively few years added to the pleasures of the whole population and is in increasing degree rendering it invaluable service as well is due perhaps to Mr. Young's brains and enterprise as much as to any other single factor.

Owen D. Young was born in Vanhornesville, in northern New York, on Oct. 27, 1874, being therefore still under fifty. He was graduated from St. Lawrence University, at Canton, N. Y., in 1894 and received his bachelor-of-laws degree from Boston University in 1896. He started practice at once, soon becoming a member of the Boston firm of Tyler & Young, a connection he retained until 1913. He is a member of the executive committees of the Electric Bond & Share Company and of the Adirondack Power & Light Corporation and a director of the Bankers' Trust Company, the Dallas Electric Company, the Buffalo General Electric Company, the General Motors Corporation and the International General Electric Company, as well as of the International Chamber of Commerce. During the war he was a member of President Wilson's second industrial conference and worked to bring and keep capital and labor in harmonious relations. He still retains his home at Vanhornesville, his birthplace.

Mercury-Turbine Saving Is More than 50 per Cent

Although the initial mercury-turbine installation made by the Hartford (Conn.) Electric Light Company has been in operation less than four months, the indicated fuel saving per kilowatt-hour exceeds 50 per cent as compared with high-grade central-station practice, Samuel Ferguson, vice-president of the Hartford company, asserted on Dec. 10 at a luncheon to press representatives who viewed the equipment at the Dutch Point generating station. Declaring that the mercury boiler and turbine development constituted a revolution in the production of electrical energy from fuel, Mr. Ferguson emphasized the future possibilities of such equipment in enabling energy to be sold to the public at lower rates and pointed out that the development appears likely to be along the line of greatly increased capacity in the not distant future.

Among those present on behalf of the company were T. H. Soren, vice-president, who is in immediate charge of the development for the Hartford organization; James Orr, superintendent of power, and for the General Electric Company, H. N. Hackett and C. D. Wagoner.

Edison Medal to Go to John W. Lieb

Vice-President of New York Edison Company Is Made Its Recipient for 1923—A Recognition of the Part Played by Central Stations in the Electrical Art

ANNOUNCEMENT was made last Saturday of the award of the Edison medal for 1923 to John William Lieb of New York City, vice-president of the New York Edison Company. As ELECTRICAL WORLD readers are aware, this medal is bestowed annually for "meritorious achievement in electrical science, electrical engineering or the electrical arts." In awarding it to Mr. Lieb the committee gives as his outstanding achievement "the development and operation of electric central stations for illumination and power," thus recognizing the tremendous part played in electrical progress by the great light and power companies of the United States and those responsible for their upbuilding and successful operation.

MR. LIEB'S CAREER

To Mr. Lieb in the course of his long connection with the electrical industry three unusual distinctions have fallen. He was an associate of Edison's in the pioneer days of electric lighting and was in at the birth of the central station. He took a prominent part in introducing the new art in its practical phases to a foreign country. He has been instrumental in developing to its present state the light and power service of the greatest city of the country—indeed, electrically speaking at any rate, the greatest city of the world.

Born in Newark, N. J., in 1860, he attended the Stevens Institute of Technology in Hoboken, which gave him the degree of mechanical engineer in 1880. Two years ago his alma mater supplemented this with an honorary degree of doctor of engineering. After his graduation Mr. Lieb entered the employ of the Brush Electric Company of Cleveland as a draftsman. In 1881 he was made an assistant in the engineering department of the Edison Electric Light Company, just organized at New York, and in 1882, as an assistant to Thomas A. Edison, he devoted himself to experimental research. In this year Mr. Edison made him electrician in charge of the installation and operation of the pioneer Pearl Street plant of the Edison Electric Illuminating Company of New York. A description of this famous undertaking, regarded then by most engineers as an experiment, but destined to be crowned by such enormous success, appeared under Mr. Lieb's name in the ELECTRICAL WORLD for Sept. 9, 1922, the fortieth anniversary of the opening of the power house.

Mr. Lieb's foreign experience was gained in Italy, where he went in November, 1882, to represent Mr. Edison in the design, installation and operation of a central station for Milan. He remained twelve years in Italy. From 1883 to 1894 he was engaged with the Milan company in power-station work and in the manufacture of lamps, dynamos, motors and other apparatus. It was under his direction that some of the earliest experiments were made in parallel operation of direct-driven alternators, the operation of large synchronous motors and long-distance transmission of high-tension alternating current by underground cables. While he was in Italy he was made technical director of the Società Generale Italiana di Elettricita Sistema Edison.

When Mr. Lieb returned to New York in 1894 he did so as assistant to the vice-president of the Edison Electric Illuminating Company, becoming vice-president and general manager. On the organization of the New York Edison Company he was made associate general manager and then appointed to

J. W. LIEB

his present position of vice-president, in general charge of operating also for the affiliated electric companies in the metropolitan district. Since 1900 Mr. Lieb has also been president of the Electrical Testing Laboratories.

ACTIVITIES AND HONORS

Mr. Lieb has taken a prominent part in the work of many of the organizations in the electrical and allied fields. He is a fellow of the American Institute of Electrical Engineers, of which he was president in 1904-05, and has served on many Institute committees, notably those on the Edison medal, public policy and code of principles of professional conduct. He is also a past-president of the National Electric Light Association, the Edison Pioneers and the New York Electrical Society. He is a fellow of the New York Academy of Sciences and member of the American Society of Military Engineers, the American Association for the Advancement of Science and the American Society for the Promotion of Engineering Education. He has been manager and vice-president of the American Society of Mechanical Engineers.

Mr. Lieb's work has been recognized by many foreign societies. He is an honorary member of the Association of Italian Engineers and Architects and of the Association of Italian Railway Engineers and has been decorated by the King of Italy. He is a member of the Institution of Electrical Engineers of Great Britain and of the Associazione Elettrotecnica Italiana. During the war Mr. Lieb served as chairman of the National Committee on Gas and Electric Service, as adviser to the federal, New York State and metropolitan fuel administrations and as chairman of the joint fuel committee representing the national public utility associations.

Mountain Island Finished

Southern Power Company's New North Carolina Power House Goes Into Service

THE Southern Power Company has just put into operation its Mountain Island hydro-electric plant, completed after two years of constant and strenuous work. This is the tenth hydro-electric plant to be put into service by the Southern Power Company, nine of them being on the Catawba River. Its addition to the generating system gives the company a total of 451,000 hp. in hydro-electric stations. Adding 105,000 hp. installed in steam plants, a total generating capacity of 556,000 hp. is obtained. It is estimated that the new plant will produce 120,000,000 kw.-hr. of electricity a year, or enough to drive approximately one-quarter of the cotton mills in North Carolina today.

The total generating capacity of the Mountain Island plant is 80,000 hp., the generating equipment consisting of four 20,000-hp. units. The dam and power house were constructed under contract by Whitehardt & Dennis. The water-wheels and governors were supplied and installed by S. Morgan Smith of York, Pa. The Allis-Chalmers Manufacturing Company of Milwaukee manufactured and supervised the installation of the huge generators. The switchboards, transformers and oil switches were manufactured by the General Electric Company and were installed by the engineers and experts of the Southern Power Company.

The dam is about half a mile long, the spillway itself being 1,000 ft. long. The spillway is on the Mecklenburg side and the power house on the Gaston County side of the river, Mountain Island itself being between the two. The power house is an integral part of the dam. The dam is more than 100 ft. high, it being estimated that there will be a head of 85 ft. of water. This dam will back water up 6 or 7 miles.

Three 100,000-volt transmission lines extend from the new Mountain Island plant and tie in with the transmission and distribution system of the Southern Power Company at Charlotte, Gastonia and Salisbury. The distribution of the product of the new plant in this manner is designed to bring about the best balanced distribution possible of the entire load on the network of the power company.

London Bankers Sue Henry L. Doherty & Company

Sperling & Company, a London banking firm, have filed a suit in the Federal District Court at New York against Henry L. Doherty & Company, demanding an accounting of profits accruing to them under an agreement of 1911, whereby the London banking house agreed to finance the formation of various public utility holding corporations. Sperling & Company claim they advanced more than $12,850,000 to the Doherty firm before the formation of the Consolidated Cities Light, Power & Traction Company and the Utilities Improvement Company. Both of these companies were merged into the Cities Service Company in December, 1913.

Sperling & Company allege that between 1911 and 1913 they advanced $10,850,000 to acquire the necessary stock and securities in these corporations, and they claim that they also advanced $2,000,000 to the Doherty firm to carry out the general plan of gaining control of the various utilities. They charge that after the formation of the Cities Service Company the defendant secured options on common stock in the Cities Service Company exceeding $2,000,000 par value and on other stock of the company. After learning of this transaction, the bankers say, they asked for an accounting and the delivery of their share in the stock. They state that these requests, made in May, 1917, were refused. They do not state the amount of their claim, but say that according to their 1911 agreement they were to share equally in the profits.

The ELECTRICAL WORLD was unable to get in touch with Mr. Doherty, who was not in New York. In his absence a statement from his attorney was given out at the offices of the company to the effect that no liability was admitted, that the plaintiffs had been fully compensated for their services and that it was thought Henry L. Doherty & Company would welcome the opportunity to present counter-claims against Sperling & Company for damages incurred in some of the transactions concerned.

Resolutions of Paris High-Tension Conference

As a result of the conference held in the last days of November in Paris the International High-Tension Electrical Transmission Committee passed the following resolution, which has just been received by the ELECTRICAL WORLD:

Considering that in all countries there is a distinctly marked tendency to simplify installations on high-tension lines, resolved, that profound study and research should be given to achieve security and permanency of such installations as well as a prevention of waste.

The following motion was submitted by the Italian delegation:

Resolved, that the remarkable contributions of the various delegations to this congress should be developed with all possible attention to detail on such fundamental bases as will bring about an international association and application of ideas, bearing in mind the always necessary variations called for in different countries by reason of local conditions and customs. When these principles have been analyzed there should be a further collaboration toward unifying on a definite basis such as are susceptible of application.

The Dutch-Belgian motions were as follows:

Resolved, that it is desirable that high-tension lines should follow as far as possible along straight lines, reducing thus the number of posts and towers required, following where possible the shortest route between two points by paralleling either the highways, rivers or railways; also, that such installations be able to secure right-of-way privileges either on public or private lands and to cross roads, rivers and railways at whatever angle may be deemed desirable.

Resolved, that it be recognized that the right is granted to establish whatever coefficient of uniform security may be decided upon as sufficient; the privilege also to be granted of crossing telegraph or telephone lines at will, once proper suspension and insulation precautions have been taken.

Resolved, that the exploiters of transmission lines shall have constant communication through telephone central stations at hours when the service may not be open to the general public, and that severe penalties be enacted against all who may commit depredations against transmission lines or plants generating energy therefor.

The congress voted unanimously a motion to the effect that the next congress shall have reports and papers in the hands of the secretary-general four months in advance if they are written in a single language, but if in two languages (of which one shall be French) the period shall be but two months, and a further motion asking that each country inscribed for each congress appoint a committee whose business it shall be to group the various papers and send them to the secretary within the prescribed time.

It was decided that the next congress shall be held in Paris in May or June, 1925.

Electrified Christmas Tree on White House Grounds

There will be a national electrified community Christmas tree this year on the "Ellipse," just south of the White House yard, in Washington. This tree, which was supplied as a gift to the President from Middlebury (Vt.) College, from whose forest preserve it was cut, has already been installed. It will be lighted first on Dec. 23 by about 2,000 lamps, about 400 ft. of 6,600-volt cable being required to connect it to the transformer. On Christmas Eve a celebration will take place, the Marine Corps band furnishing music and a chorus of 3,000 children singing carols, which will, if possible, be broadcast by radio. The tree will remain lighted throughout Christmas week from sunset to sunrise.

The White House outdoor Christmas tree is the outcome of a suggestion from the Society for Electrical Development. The idea was quickly taken up by electrical and other bodies in Washington. As a result of such combined activities there will, it is expected, be a large number of electrified Christmas trees this year on state capitol grounds as well.

Joint Plants Planned for Delaware Tributary

The Shohola Water Power Company, the Bingman Water Power Company and the Blooming Grove Water Power Company have declared their intention jointly to construct two projects on Shohola Creek, a tributary of the Delaware River, in the northeastern corner of Pennsylvania. The declarants propose to construct a 60-ft. dam at the head of Shohola Falls. They plan to run a pipe line from the dam so as to develop a head of 270 ft. at a power house in which two 4,000-hp. units are to be installed. A second dam at Cold Springs Lake is to be 60 ft. high. A second pipe line will develop a head of 290 ft., and three 4,500-hp. units are to be installed. The project will store 2,500,000,000 cu.ft. of water. It is probable that the Federal Power Commission will take jurisdiction over this project because that amount of storage would affect navigation on the river.

Schuchardt on "Engineers as Public Advisers"

R. F. Schuchardt, electrical engineer for the Commonwealth Edison Company, Chicago, addressed the Milwaukee Section of the A. I. E. E. and the Milwaukee Engineering Society lately on a subject the importance of which he has been endeavoring to impress upon engineers in various parts of the country. This is the obligation and responsibility resting upon engineers to serve voluntarily as public advisers on economic engineering questions even when advice is not sought. He emphasized the point that engineers are too often prone to overlook the economic side of engineering problems, and that until they inform themselves on this phase of various subjects of public interest the public cannot be expected to recognize the economic limitations to certain engineering proposals which are being made every day.

The first thing for the engineer to do, Mr. Schuchardt maintained, is to acquaint the public with the close relation that electric power production and utilization bears to individual and industrial welfare—the absolute dependence of present-day civilization upon the utilization of electric power. The public must be impressed with the fact that economic salvation lies in greater production per man and that this will come only from more extensive substitution of power for labor, in which the application of electricity will be most influential. Engineers should, the speaker said, inform the public on the economic problems involved in electrifying steam railroads, conserving water supply and saving coal, the relative merits of electric service from the public utilities and of isolated plants, and similar questions. It is the total economic saving, not the saving in just one process or part of an undertaking, that is important.

Montaup Plans Made Public

One 32,000-Kw. Unit in First Installation—Initial Voltage of 66,000, Afterward 115,000

PRELIMINARY plans for the Montaup Electric Company's tidewater steam generating station to be built by Stone & Webster, Inc., on Mount Hope Bay, near Fall River, Mass., were submitted to the Massachusetts Department of Public Utilities on Dec. 4 by R. F. Whitney, president Fall River Electric Light Company and general manager of the Montaup company, and A. Stuart Pratt, vice-president Edison Electric Illuminating Company of Brockton, Mass.

As already reported, the Montaup station will be interconnected with the Fall River, Brockton and Blackstone Valley Gas & Electric Company's systems as indicated in the accompanying map, and the estimated cost to the Montaup company of the initial installation, including transmission lines and switching stations, is $7,037,436. One 32,000-kw. unit and three boilers will constitute the first installation in the Montaup plant, which will be built at Somerset and designed for burning fuel oil at present, with a building sufficiently large to house two 32,000-kw. units.

Three 1,500-hp. boilers designed for 400 lb. working pressure are proposed. It is planned to build the high-tension switching for 115,000-volt operation, but the initial operating voltage contemplated is 66,000. A line to New Bedford will eventually be built.

Brief News Notes

Long Beach Plant to Be Enlarged by 60,000 Kva.—The Southern California Edison Company has retained Stone & Webster, Boston, to build an extension to its Long Beach steam plant to house two 30,000-kva. turbo-generators on order from the General Electric Company.

Iowa Southern Utilities Buys Eight Iowa Plants.—The Iowa Southern Utilities Company of Centerville has announced the purchase of the Iowa utility properties formerly owned by the Union Power & Light Company of Omaha, Neb. These are Chariton, Osceola, Lucas, Woodburn, Murray, Russell, Oakley and Lacona. All of the Union Power & Light holdings in Nebraska, Iowa and South Dakota were sold to the Albert Emanuel Company of New York City, which in turn sold the Iowa properties to the Iowa Southern Utilities Company.

Electric Truck Business Consistently Growing.—During the first eleven months of this year 854 electric trucks have been sold, according to the Society for Electrical Development. To the central stations of the country, the society points out, this means an off-peak load of approximately 5,200,000 kw.-hr. annually, which in round figures represents a yearly income of $260,000. In New York City alone 438 "electrics" were sold during the period named as compared with 326 during the first eleven months of 1922—an increase of 34 per cent. In Boston the sale of electric trucks has increase 76 per cent.

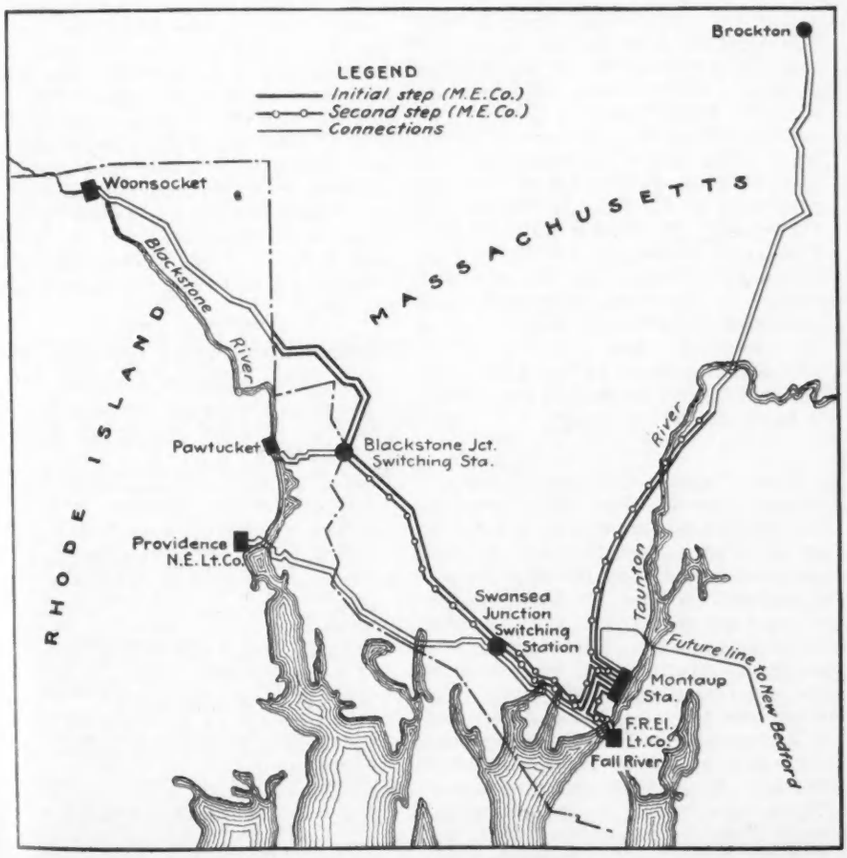
Kentucky Public Service Company to Change Name.—The Kentucky Public Service Company, which manufactures electricity at Bowling Green, Frankfort and Hopkinsville, Ky., and Clarksville, Tenn., desires to change its name to the Kentucky-Tennessee Light & Power Company. It has obtained the approval of the Kentucky authorities, and when that of the Tennessee commission is given the change will be made.

Lighting of Horseshoe Falls to Be Extended.—Extensions to the illumination of the Horseshoe Falls at Niagara are planned by the Queen Victoria Park Commission. Two batteries of light will be put in, one on the ledge near Table Rock and the other on the roof of the power house of the Ontario Power Company. The lighting system will also be extended to Dufferin Islands. The work will be started and completed in the spring.

Commission Rejects Floor-Area Rates for Lafayette.—The Indiana Public Service Commission has rejected a proposal by the Northern Indiana Gas & Electric Company to change the basis for electric service charges at Lafayette to that previously authorized for East Chicago, Whiting and Hammond, based on floor area. Objection is said to have sprung up in the commission since its previous order, which was made on Nov. 9, and the majority of that body ordered, instead of the floor-area system, a reduction of the regular schedule rates in Lafayette amounting to about $31,000.

Long Lake Plant of Washington Water Power Company Nearly Completed.—The fourth unit to be installed in the Long Lake plant of the Washington Water Power Company, which has been built in a narrow gorge of the Spokane River, 35 miles from the city of that name, is to be ready by the first of the new year. It is rated at 22,500 hp. and will bring the capacity of the plant up to 90,000 hp., the figure for which it was constructed. This plant has been built under unusual engineering difficulties at a total cost of about $6,000,000. The spillway is one of the largest in the world.

Bolivian Promoters See Great Electrical Output from Extinct Volcano.—Among the "trade opportunities" reported recently to the Department of Commerce is an extinct volcano which no longer emits fire and smoke but through vents in its sides releases vast quantities of superheated steam, which, promoters claim, can be converted into electric power capable of producing 400,000,000 kw.-hr. per annum. The



THREE MAJOR CENTRAL-STATION SYSTEMS WILL BE SERVED BY THIS INTERCONNECTION

volcano, called "Tatio," is on the Chilean-Bolivian frontier. It is asserted that the Bolivian government could be induced to take the electricity produced for the use of electrified state railways and that power could be sold to mining companies. A Bolivian company has a concession for sale for £1,000,000.

South Dakota Company Sold.—The Aberdeen Light & Power Company, with plants in Aberdeen, Watertown, and Yankton, S. D., and in Nebraska and Iowa, has been sold by the Union Power & Light Company of Omaha, for $935,500, to the Northwestern Public Service Company. The general offices of the new company are to be maintained at Aberdeen with the organization of a new company to be incorporated in Delaware. The transfer, it is understood, includes the public utilities of the Omaha company at North Platte, Neb. The new company is a subsidiary of the Albert Emanuel Company of New York City.

Electricity for Moffat Tunnel.—Work on the 6-mile Moffat Tunnel through the Continental Divide, 50 miles west of Denver, with which the Denver & Salt Lake Railroad will replace the open Summit Pass, has begun in earnest, and on Dec. 1 the east heading of the pilot tunnel, designed to carry water to Denver, was 370 ft. under ground and the west heading 630 ft. under ground. The construction company has contracted with the Colorado Power Company for 1,000 hp. of 44,000-volt energy delivered at the east portal, and a 30-mile transmission line will be built to convey this power, which will be used for lighting and for operating machines and tools.

Water and Power Act Indorsed by San Francisco Labor Council.—The San Francisco Labor Council indorsed the water and power act at a meeting on Dec. 7 and pledged its support to the public ownership measure which was defeated at the last state election. All unions affiliated with the council will be asked to contribute to the campaign fund for the act, which is designed to put the state into the business of developing hydro-electric power. Those who put the matter before the council asserted that the future control of industry, labor and government in California was involved in the issue of private as opposed to public power development. It is understood that the proponents of the original water and power act are now redrafting the measure for submission to the people at the 1924 election.

California Railroad Commission's Report.—In transmitting to the Governor of California its annual report for 1922-23 the California Railroad Commission dwells on the continued improvement in the financial condition of utility companies. It claims that the rates of gas and electric utilities were reduced more than $5,000,000 during the fiscal year by direct action of the commission, and that the reductions in the rates of the Pacific Gas & Electric Company and the Great Western Power Company alone amount to $3,000,000. The work of the engineering department is referred to at length, with allusion to the rapid march of hydro-electric development and the enforcement of standards for transmission-line construction.

Long Island Railroad Preparing for Electrification Within New York City Boundaries.—The Long Island Railroad Company is completing plans for the electrification of its facilities within the limits of Greater New York and will submit them to the Transit Commission within a few weeks. It will contend, however, that it is impossible to complete the work by 1926, as the law requires. The Long Island Railroad will have to electrify considerable stretches of its track in Queens Borough to obey the law, although a large part of its line there is already electrified. It is unofficially estimated in railroad circles that the company will have to expend more than $25,000,000 should it desire to install the same modern facilities that the New York Central proposes on the west side of the city.

Applications to New York Public Service Commission.—The Niagara, Lockport & Ontario Power Company of Lockport, N. Y., which develops electricity on the Oswego and Salmon Rivers in Oswego County, has applied to the Public Service Commission for permission to acquire by condemnation certain additional water and riparian rights below its present developments. The Saranac Company of Plattsburg has asked permission to acquire the Saranac River Power Corporation, which is building a new power plant and dam about 4 miles west of Plattsburg. The energy generated at this plant will be transmitted to the new paper mill of the Saranac Company in Plattsburg. The Kanes Falls Electric Company, operating in Fort Ann, Washington County, and the adjoining towns of Granville, Kingsbury and Queensbury, has made application to the commission for authority to sell part of its property to the Adirondack Power & Light Corporation, from which it has been buying energy.

Utah Copper Company Turns to Electric Shovels.—The first of two electrically operated shovels to be installed by the Utah Copper Company for test purposes in its open pit mine is now operating, marking an important departure in operations at the company's Bingham property. The one now operating is a direct-current type, made by the General Electric Company. The other one to be installed and operating in a short time will be the alternating-current type made by the Westinghouse Electric & Manufacturing Company. These shovels will be pitted against each other to determine which type is best adapted to the company's needs. The company plans gradually to substitute electrical shovels for those propelled by steam and hopes to effect a saving of 10 cents a ton in the mining of its ore.

Associations and Societies

New York Electrical Society.—"Why Electric Heat Is Preferable" was the subject of an address by J. C. Woodson of the Westinghouse Electric & Manufacturing Company before the New York Electrical Society on Tuesday, Dec. 18.

Kentucky Association of Public Utilities.—This organization will gather at the Seelbach Hotel, Louisville, on Jan. 10, when a "get-together" dinner will be held. On Jan. 11 a program will be presented of which one feature will be a talk on "Electrical Development" by W. W. Freeman, president Union Gas & Electric Company, Cincinnati. J. R. Downing, vice-president Citizens' Union National Bank, Louisville, will speak on finance, F. F. Gilmore, Jr., on safety, and representatives of the railway, gas and telephone industries will be heard.

National Association of Lighting Equipment Dealers.—This body will hold a convention at the Hotel Sherman, Chicago, on Jan. 21-26 in connection with the fifth annual "lighting equipment market" of the Associated Lighting Industries, all the exhibits and meetings to be under the one roof. Addresses on "Period Design," "Extension of Credit," "Slogan Results for 1923," "Results in Detroit from Talking and Advertising 'Three per Cent for Fixtures,'" "Shop and Selling Costs" and "Methods Used by Dealers for Remunerating Salesmen" will be given, and there will be discussions of a practical nature and "questions and answers."

Coming Meetings of Electrical and Other Technical Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 7 issue, page 56, for latest list.]

American Physical Society—University of Cincinnati, Cincinnati, Dec. 27-29. H. W. Webb, Columbia University, New York City.

American Engineering Council (F. A. E. S.)—Washington, Jan. 10-11. L. W. Wallace, 26 Jackson Place, Washington.

Kentucky Association of Public Utilities—Seelbach Hotel, Louisville, Jan. 10-11. E. F. Kelly, Louisville Railway Company.

Wisconsin State Association of Electrical Contractors and Dealers—Pfister Hotel, Milwaukee, Jan. 17-19. H. M. Northrup, 23 Erie Street, Milwaukee.

Technical National Section, N. E. L. A.—Birmingham, Jan. 28-Feb. 1.

Western Association of Electrical Inspectors—Hotel Fontenelle, Omaha, Jan. 29-31. W. S. Boyd, 175 West Jackson Blvd., Chicago.

American Institute of Electrical Engineers—Midwinter convention, Bellevue-Stratford Hotel, Philadelphia, Feb. 4-8. F. L. Hutchinson, 33 West 39th St., New York.

Commercial National Section, N. E. L. A.—St. Louis, Feb. 27-28.

Commission Rulings

Operation at a Loss.—All authorities agree, said the Indiana Public Service Commission in granting increased water rates to the Montpelier Utilities Company, that no utility company can be required to continue operation when under its existing rate schedules such operation must necessarily be conducted at a loss. A utility is entitled to earn some return upon the value of its property or to be authorized to abandon its operation. The commission dwelt upon the difficulty of a situation where rates to private consumers could not be raised without actually decreasing revenue.

Management — Income Tax — Donations—Penalizing Paying Customers for Delinquents' Fault.—In setting rates for the Red River Power Company the North Dakota Board of Railroad Commissioners made decisions on several points. It claimed the power to determine whether the policy adopted by the management of a utility company is efficient, as this has a bearing on the reasonableness of the rates. It ordered that federal income taxes be considered as an operating expense. It barred from that account donations, presents to employees and club dues outside the state, which, it said, should come out of net earnings. A retaining fee to a local attorney was also barred, there being no reason, in the commission's opinion, why legal advice should not be furnished by the management in another state. The commission further asserted that consumers who pay their bills promptly should not be penalized by requiring them to bear excessive charges because of uncollectible accounts when the utility was permitted to file meter deposit rules as a protection against such accounts.

Compensation to Be Spread Over Long Period Must Not Be Based on Present-Day Cost.—In disapproving the original application of the Union Electric Light & Power Company of St. Louis to lease the new Cahokia plant from the Union Electric Light & Power Company of Illinois (see ELECTRICAL WORLD, Nov. 17, page 1036), the Missouri Public Service Commission said: "The new plant in Illinois is being constructed at the peak of high prices. The terms of the lease as proposed fix the present-day high prices as the foundation of the charges of percentages for depreciation and return thereon, the same to be made a part of the operating cost of the Union company of Missouri and reflected in the rates charged to its patrons. The lease in effect makes investment cost of the plant in Illinois the basis for calculating rates for thirty-five years. The approval of the proposed lease would, in substance, bind the commission to the investment cost of the new plant at the present high prices for a long period, and such a course would be inconsistent with the rulings of the courts to the effect that the fair value of property for rate making must reflect the prevailing cost at the time the valuation of the property is made. Thus it appears that advantages to the company to be derived from the lease as now offered are outweighed by the disadvantages thereof to the public in fixing the present-day investment cost of the property as a charge to be paid by the public for a long term of years. The commission is loth to approve an agreement which fixes operating costs on a basis of valuation inconsistent with the legal rules for measuring fair value for rate making. The door should not be closed as proposed by this contract upon the right of the public to have the benefit of lower construction costs and a lower rate of return as future business conditions may justify in the application of the rule now established for a reasonable return upon present fair value of property devoted to public use. Therefore the commission should refuse to approve the lease as offered."

Interconnection Authorized Against Protest of Institution.—On the ground that an interconnection between the Laconia Gas & Electric Company and the Utilities Power Company, Bristol, will be of great public interest, the New Hampshire Public Service Commission has issued a finding against the Laconia School for Feeble-Minded Children, which sought to prevent the construction of the necessary transmission line across its grounds. Energy from a new hydro-electric plant under construction at Bristol will better enable the Laconia company to serve the local public. The commission recommends a nominal rental for the transmission-line right-of-way, that the wood and timber resulting from the removal of trees by the company be supplied to the institution and that the line be properly safeguarded against trespass.

Federal Income Tax and Rate of Return.—In a case involving the steam-heating rates of the Pacific Gas & Electric Company in the cities of Oakland and San Francisco, the California Railroad Commission had this to say on the federal income tax and its relation to the rate of return: "Under the recent decision fixing electric rates a return of 8 per cent on the rate base for the electric properties was found reasonable, but the federal income tax of 12½ per cent of net corporate income was excluded from operating expenses. The United States Supreme Court has since definitely ruled that this tax should be included as an operating expense. (Georgia Railway & Power Company vs. Railroad Commission of Georgia, decided June 11, 1923.) In the same decision the court also points out in the following language the close relationship between the inclusion and exclusion of this tax from operating expenses and the rate of return which may be deemed fair and reasonable: 'It must be borne in mind, as pointed out in Galveston Electrical Company vs. Galveston, that since dividends from the corporation are not included in the income on which the normal federal tax is payable by stockholders, the tax exemption is, in effect, an additional return on the investment.' As was indicated in the decision in the electric rate proceeding, a return of 8 per cent from which this tax must be paid was equivalent to a net return after payment of the tax of 7.6 per cent. Such a return was held to be sufficient to attract the new capital that must be continuously invested if the system is to keep pace with the demands of the consuming public. In keeping with the decision of the Supreme Court, federal income tax has been considered herein as an operating expense, and in harmony with the electric rate decision a net return after the payment of this tax of 7.6 per cent on the estimated historical cost of the property is found to be reasonable."

Recent Court Decisions

California Railroad Commission May Classify Consumers.—In a suit brought by the Live Oak Water Users' Association against the California Railroad Commission on the ground of discrimination between and classification of consumers, the California Supreme Court held that such discrimination when based upon logic and justice is within the powers of the commission and not subject to annulment by the court. (219 Pac. 65.)*

Hydro-Electric Company Must So Build Dam as Not to Interfere with Operation of Grist Mill.—A case that has attracted unusual attention in Iowa has just been heard a second time in the District Court after being remanded by State Supreme Court two years ago for retrial. In this case (Harp vs. Iowa Falls Electric Company) the plaintiff sought to restrain the electric company from maintaining a dam across the Iowa River which he asserted interfered with the operation of his grist mill, one long ago built and for which prior rights were claimed. The court now finds that the company has the right to maintain a dam across the river, but that it must be of a height that will not interfere with the successful operation of the plaintiff's mill property. The electric company will have until August, 1924, to construct such a dam.

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*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

Richard S. Shoemaker New President of A. I. and S. E. E.

Richard S. Shoemaker, who was elected president of the Association of Iron and Steel Electrical Engineers at its convention in Buffalo, has been associated with the American Rolling Mill Company since 1916, when he became superintendent of maintenance. Mr. Shoemaker is a native of Philadelphia and entered the steel mills early in

R. S. SHOEMAKER

life. In 1903 he engaged in work connected with the construction of new pipe mills for the National Tube Company of Lorain, Ohio. After the completion of this work he joined Milliken Brothers, Inc., on Staten Island, New York City, in the capacity of electrical engineer, and he had charge of the electrical installation in the Singer Building in New York in 1905-1906. The following year found Mr. Shoemaker out in Cleveland with the Electric Controller & Manufacturing Company, where he specialized on the control of steel-mill apparatus. Subsequently he became identified with the Pittsburgh Steel Company as chief electrical engineer and later served as electrical engineer of the Algoma Steel Company, Sault Ste. Marie, Ontario, Canada, and with George F. Porter, engineer of construction on the St. Lawrence & Dominion Bridge at Quebec. At the present time Mr. Shoemaker is in complete charge of the mechanical, power and electrical departments at the American Rolling Mill Company's plant at Middletown, Ohio.

W. R. Woodward has recently been made chief engineer of the C. W. Hunt Company of New York and West New Brighton, Staten Island, manufacturers of coal-handling machinery, industrial trucks and conveyors.

H. M. Ross has succeeded Orin Haines as chief engineer of the Barnesboro-Spangler Electric Light Company, Barnesboro, Pa.

H. C. Thuerk, formerly commercial manager of the Keystone Power Corporation, Ridgway, Pa., is now power engineer with the Erie (Pa.) Lighting Company.

A. W. Pride, who has been connected with the Derry (Pa.) office of the Westinghouse Electric & Manufacturing Company, has been transferred to Emeryville, Cal., in charge of a new porcelain section.

J. Lawrence Gilson has been appointed New York manager of Day & Zimmermann, Inc., engineers, whose headquarters are in Philadelphia. Mr. Gilson was formerly connected in the capacity of engineer with E. I. du Pont de Nemours & Company and with the National Lead Company.

S. Z. Mitchell, president of the Electric Bond & Share Company, has been made president of the American & Foreign Power Company, Inc., recently incorporated in Maine to enter the public utility field of Cuba, Central America and South America. The organization of the new company was effected by the Electric Bond & Share Company.

Frederick N. Dodge, formerly sales manager of George W. Smith & Company, Inc., Philadelphia, has joined the staff of the Society for Electrical Development. At one time sales promotion manager of the Fairbanks Company, New York, Mr. Dodge was more recently connected with the Dort Motor Car Company of Flint, Mich., first as assistant advertising manager with the factory organization and afterward as sales manager at Cleveland and later at Philadelphia.

S. R. Inch, whose duties D. C. Green is assuming, has resigned from the Utah Power & Light Company to join the Electric Bond & Share Company in New York. Mr. Inch's connection with Utah will not be severed since he remains a vice-president and director of both the Utah Power & Light Company and the Utah Light & Traction Company. He became associated with the Utah Power & Light Company as general superintendent in 1913. Prior to that time he had been stationed in Montana, managing public utility properties owned by W. A. Clark. He was made operating manager of the company in May, 1915, and less than three years later he succeeded C. E. Groesbeck as vice-president and general manager of the Utah Power & Light Company and vice-president of the Utah Light & Traction Company.

D. C. Green Made Vice-President of Utah Companies

D. C. Green, formerly vice-president and general manager of the Fort Smith (Ark.) Light & Traction Company, has been named vice-president and general manager of the Utah Power & Light Company and vice-president of the Utah Light & Traction Company, succeeding S. R. Inch. Mr. Green has had a wide experience in the management of electric and gas utilities. After being graduated from Purdue University in 1908 he became associated with the San Diego Consolidated Gas & Electric Company and subsequently went to Oregon as manager of the Oregon Power Company at Albany and Marshfield and of the Everett Gas Company at Everett, Wash. Early in 1915 he went to Salt Lake City

D. C. GREEN

as manager of the Salt Lake division of the Utah Power & Light Company, which position he relinquished to become general manager of the Fort Smith properties. In addition to the ability gained through wide experience in the management of utilities, Mr. Green is particularly well qualified to handle the duties of his new position owing to his former association with the Utah Power & Light Company and his consequent familiarity with that company's operations and policies.

J. J. Cagney has been appointed valuation and rate engineer of the General Engineering & Management Corporation, New York. Mr. Cagney has had a wide and varied experience in the electrical industry as commercial manager, secretary, treasurer, and general manager of a number of companies, covering a period of twenty-five years.

W. M. Sawdon, professor of experimental engineering at Cornell, has been elected Mayor of Ithaca, N. Y. Professor Sawdon was associated with Prof. R. C. Carpenter for many years in experimental and consulting engineering work. His participation in the civic activities of Ithaca is a source of gratification to his engineering associates as well as to others.

John E. Magnusson has become assistant to the electrical engineer of the Phoenix Utility Company, Duluth.

H. M. Outhwaite is now secretary and treasurer of the municipal electric lighting and power system, West Selkirk, Manitoba, succeeding D. J. Black.

Charles Taylor has been made manager and chief engineer of the municipal electric lighting and power system, West Selkirk, Manitoba, succeeding Donald G. Sutherland.

J. B. Harvey has been made general manager of the Brandon (Manitoba) Gas & Electric Company, succeeding F. H. Brooks.

T. J. Carley is now secretary and treasurer of the municipal water, light and power plant at Fenelon Falls, Ontario, succeeding J. L. Arnold.

T. V. K. Swift, who has been connected with the engineering department of the Central Hudson Gas & Electric Company, has recently been transferred to the operating department (electric).

Donald Steinet, formerly connected with the accounting department of the Central Hudson Gas & Electric Company, has been transferred to the electric operating department to succeed J. Haulenbeck, who is now illumination engineer in the commercial department.

Charles E. Glassner, formerly associated with the General Electric Company, has recently become sales engineer for the National Carbon Company, New York.

W. H. Haines, formerly chief inspector of the Schenectady works of the General Electric Company, has retired, according to an announcement made by C. E. Eveleth, works manager. Mr. Haines has been succeeded by W. W. Wagner.

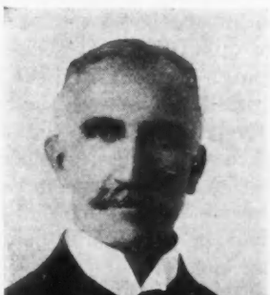
Oliver B. Capelle, who has been connected with the Apex Electrical Distributing Company's publicity department for three years, has been appointed advertising manager of the company. Mr. Capelle was formerly with the United Publishers' Corporation, New York, and the Penton Publishing Company, Cleveland.

W. M. Goodrich has been made manager of the electrical division of the Lindsay Light Company, Chicago, after spending twelve years in charge of the lighting equipment division of the Western Electric Company, Chicago. Mr. Goodrich allied himself with the Western Electric Company in 1906, after leaving Washington University, St. Louis.

J. W. Lewis, assistant comptroller of the General Electric Company, has been appointed assistant to President Gerard Swope. Mr. Lewis has been assistant comptroller, with headquarters in New York, since April 1, 1921. Previous to that time he was chief statistician of the company, having been appointed to that position April 1, 1911. He entered the service of the company June 1, 1910, in the general accounting department, statistical division, having previously been connected with the American Locomotive Company.

Sir Charles Bright, Engineer and Author

Sir Charles Bright, consulting engineer and well-known author of scientific and engineering books, was educated at Lancing College and King's College, London. During his professional career Sir Charles, following in the footsteps of his father, the late Sir Charles Tilston Bright, who laid the first Atlantic cable, has been engaged in the construction, laying and repairing of some 25,000 miles of submarine and land telegraphs. He has acted as engineer and electrician on a number of cable expeditions in various parts of the world, as well as in preliminary submarine surveys. He was associated with the Interdepartment Cable Communications Committee, the House of Commons



SIR CHARLES BRIGHT

radio-telegraphic committee, the Dominions Royal Commission, and represented the Australian Commonwealth at the international radio-telegraphic conference in 1912. In addition to the very many scientific and engineering books which Sir Charles has to his credit are contributions to the leading quarterly and monthly reviews as well as to the *Times*, the Encyclopædia Britannica, the Statesman's Year Book and various standard works of reference. Sir Charles has given numerous lectures to the Royal United Service Institution, Royal Naval War College, Navy League, London Chamber of Commerce, Cambridge University and Eton College, besides contributing papers to the Institution of Electrical Engineers, the Institute of Civil Engineers (of both of which he is a member), the Royal Geographical Society and the Royal Aëronautical Society.

David Sonkin has recently become affiliated with F. A. D. Andrea, Inc., New York, as radio engineer.

Blaine Archer, for seven years assistant manager of the Maryville (Mo.) Electric Light & Power Company, has been appointed district manager for the Iowa Service Company at Shenandoah. Mr. Archer is succeeding R. J. Ritchie.

A. G. Steinmayer, formerly assistant chief engineer with the Electrical Engineers' Equipment Company of Chicago, has resigned to become electrical engineer with the Line Material Company of South Milwaukee, Wis.

Obituary

Charles Frankel, president of the Frankel Solderless Connector Company, New York, died suddenly on Dec. 18. Mr. Frankel was sixty-one years of age.

William H. Williams, district superintendent of the Central Maine Power Company, Augusta, died at his home in that city on Dec. 5 after an illness of two weeks. Mr. Williams had long been identified with electrical enterprises in New England. When the Kennebec Light & Heat Company was chartered in 1887 he was made superintendent and continued in that capacity until it was reorganized in 1910 as the Central Maine Power Company. Mr. Williams, who was seventy-three years of age, was the father of George S. Williams, the present general superintendent of the company.

Walter E. McCoy, formerly chief electrical engineer of the United Electric Light & Power Company, New York City, died at Stamford, Conn., Dec. 16, at the age of fifty-two years, after an illness of more than two years. Mr. McCoy was well known and well liked by members of the electrical profession. He was born at Pittsburgh on July 30, 1871. At an early age he entered the employ of the Westinghouse Electric & Manufacturing Company, where he remained until May 1, 1895, when he became connected with the United Electric Light & Power Company, remaining with that company up to the time he was stricken with the illness which proved fatal. He was a fellow of the American Institute of Electrical Engineers and active for many years in the affairs of the National Electric Light Association.

Ralph E. Gilman, special engineer in charge of turbo-generator engineering of the Westinghouse Electric & Manufacturing Company, died in the Methodist Hospital, Los Angeles, Dec. 5. Mr. Gilman, on account of illness, had been granted a leave of absence from his duties in East Pittsburgh, Pa., to go to the Pacific Coast in an effort to improve his health. Mr. Gilman entered the employ of the Westinghouse company immediately after his graduation from Leland Stanford University in 1898 and completed the apprentice course of the company in January, 1901. For the next two years he was in the engineering department. In 1903 he was transferred to the British Westinghouse Company, and he spent the next five years in London, England. In 1908 Mr. Gilman was recalled to East Pittsburgh and assigned to special duties in the power engineering department, with which he was continuously connected until the time of his death.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

A Problem in the Glassware Industry

A Tremendous Waiting Market for Residence Glassware Blocked by a Demoralized Distribution—What Is Needed to Set the Situation Right

By Earl E. Whitehorne
Commercial Editor Electrical World

THE illuminating glassware industry is confronted with a difficult problem. Something like nine million homes are wired and using electric light in these United States and only about half the lamps in service in these homes have shades on them. It is estimated, therefore, that there is today a potential market for close on to 90,937,000 shades needed merely to equip bare lamps now waiting in the wired houses of America. A proportion of these lamps, of course, would be shaded with silk or parchment, but this does not consider the additional market for replacement shades in these same homes, the new and more artistic shades that can be sold to take the place of old, unattractive glassware that owners are already tired of. Nor does it embrace the shades that can be sold to equip the fixtures that go into the million or more homes that every year are now being newly wired.

A Tremendous Market

Clearly the market is tremendous, but very little actual progress is being made in getting the job done. Distribution in the residence illuminating glassware field is demoralized. The electrical jobber will not touch the line. The contractor-dealer is not making any effort to sell it. The manufacturers, with all this opportunity staring them in the face, have a moribund market on their hands and cannot agree as to what to do about it.

Commercial lighting glassware, of course, is quite another matter. Here great progress has been made; for the rapid development of new types of store, window and office lighting units in support of the active work that has been done by central-station companies all over the country to build up the commercial lighting load has resulted in volume production and standardization of glassware, and created a very prosperous business. Commercial globes and shades are being manufactured in large quantities and sold largely by campaign methods, and the jobber finds it profitable to stock such a unit and actively sell it to the central station companies and contractor-dealers that his salesmen call on. Business in the commercial glassware field is good, and nobody is worrying about it.

The Three Approaches

There are three directions from which the residence glassware market will ultimately be approached:

1. Glassware can be sold to already-wired houses to shade their lamps just as soap and scissors are sold, by creating a demand through advertising and the merchandising of the goods to the home. Local hardware, department, specialty and electric stores will sell this way.

2. Central-station companies for some years have been preaching to the public against glare, yet half the lamps in the homes today are bare. The central station can be interested to promote this idea and to take up the active merchandising of glassware to get these lamps shaded to prevent glare, raise the standard of household illumination and induce the use of larger lamps by shading all lights.

3. Glassware can be sold by contractor-dealers to newly wired houses to complete installations properly.

Some effort has been made by individual manufacturers to develop this business by the first method, but the movement has never gone very far. Glass shades are not very easy to sell to a household that has never been educated to the value of shades. Shades in use are not easily displaced, and no pressure has ever been put upon the dealer to do this.

The second method has never been seriously attempted. The third method obviously presents the most direct means of approach and the most immediate opportunity, since probably one-third of the electrical contractors are already selling glassware today in an indifferent way, and most of them are sending customers whose homes are wired to some fixture store with a card that wins them a commission on the sale.

Residence Glass Not Being Sold

The contractor is the accepted medium of distribution today in the glassware field and the present set-up as to distribution comprises a variety of manufacturers, the leaders being affiliated in a group known as the Illuminating Glassware Guild; a certain number of glassware and fixture jobbers; the electrical jobbers who sell commercial and residence glass, and then the dealer, who may be a fixture store, a wiring contractor, an electric shop or a department, hardware or non-electrical specialty store. Over-the-counter sales from retail stores are small. The contractor moves most of the goods when he wires homes. But even he is making no creative effort to develop the market. So residence glassware is not being sold.

The electrical jobber offers the natural direct approach to the electrical contractor and dealer because he is selling them the major part of their other purchases. A large number of jobbers are now selling fixtures. Glassware is needed to equip these fixtures and complete the installation. But the electrical jobber today looks upon glassware as an impossible thing for him to sell. He knows that the glassware people have for years been fighting among themselves and cutting prices right and left. He knows that there is no stability to type, design or price—in short, that glass does not present a jobbing proposition at the present time. He believes that there are three things fundamentally wrong with the glassware situation which must be corrected before he can become seriously interested.

In order to interest him in resi-

dence glassware the jobber feels that the glassware manufacturer should:

First—Package the line in such shape that the jobber and the dealer can handle it profitably. That would mean putting up say six, twelve or eighteen shades in a package that could be distributed and retailed with a minimum of breakage, in cartons that would advertise the line and assist in the selling.

Second—Develop a sufficient number of standard shades that would be distinctive, perhaps "guild designs," produced by all members of the group already affiliated, and supported, naturally, by the collective advertising of the group as well as that of the individual members, so that the designs would become known to the public and a sufficient market would be established to give the jobber a volume of business that would justify him putting real effort behind the line. A sufficient diversity could be introduced into this "guild line" to permit personal preference in selection, yet the manufacturer would enjoy the economic benefits of mass production and the jobber would also enjoy a volume that would make it a jobbing line.

Third—Support residence glassware with a policy based on ethical and economical principles. The electrical jobber will never sell this line until he can be sure of his profits, and he never will feel sure until the glassware manufacturers stop cutting prices, copying one another's designs, extending jobbers' discounts to retailers and consumers and in other ways indulging in destructive competition. Without protection on prices no line can be sold successfully by the jobber, and the jobber knows that it would be utter folly to devote time to developing the market for glassware as long as he is in danger of having his customers stolen away by price competition from his own supplier and from other prominent manufacturers. He believes that he should have a liberal profit if he is to push glassware, to cover breakage and the costs of market creation.

As one jobber expressed it recently, if he should decide to take up glassware, it would be necessary for him to call in all his salesmen and absolutely convince them that these three essentials had been satisfactorily met. He would have to sell them this new basis for confidence in glassware before he could expect to get the slightest bit of additional support from his salesmen for the sale of glassware. Such is the general feeling. In fact, glassware and fixture salesmen themselves frankly admit that it is hopeless for the electrical jobber to try to do anything in the residence glassware field until such a policy is established.

Precedent in Fixtures

There is no question that a strong and practical market can be built up for residence glassware. Here is a vital element necessary for the completion of every installation. The job is not done until a fixture is installed; the fixture is not complete until it is equipped with glassware. The present trend toward ball lamps without shades is simply a reflection of the demoralized situation in the glassware industry. Fixture manufacturers, dealers and jobbers are despairing of securing glassware on a profitable and commercial basis and, rather than struggle with these conditions, are selling more and more fixtures with unshaded ball lamps, although they know the unshaded lamp produces glare and that glare is not good lighting and therefore should be avoided.

The American public is willing to buy glassware, just as it is willing to buy any other meritorious article that renders a service. The electrical jobber for years has had the same general attitude toward fixtures that he has today toward glassware, but the fixture industry has begun to recognize this and a number of manufacturers are now offering a line of fixtures that the jobber can handle, supported by a policy that makes their distribution profitable. If the glassware manufacturers will follow suit and establish glassware on an economic basis, the jobber will take up the sale of residence glassware eagerly. So will the retailer. It will be a specialty requiring very little interpretation, and that can be easily sold.

Product of Trading

This trouble in which the glassware manufacturers find themselves is a product of an era of trade. For many years they have devoted themselves very largely to selling glassware on a "catch-as-catch-can" basis, and they have never co-operated to any extent for the establishment of a substantial market for standardized products that could be supported by policy and publicity and would build up an enduring demand. The hardest job will probably be for these manufacturers to get together and agree on uniform policies to be followed.

Yet there have been some notable examples in the fixture business where a manufacturer has deliberately established a price and a policy on his own line and has himself developed a degree of standardization and volume that has made good business both for him and his distributors. It can be done.

The principal thing is that here are these millions of unshaded lamps in use and this tremendous growing need for glassware in newly wired homes. It presents an opportunity so big that the mind does not follow the figures. But in spite of this residence glassware is not being sold in a volume that pays either the producer or the distributor. It would seem to be important to the entire industry that these underlying causes be faced and readjusted so that this important piece of market development can be speedily and well done.

Department of Commerce and Selling Combinations

Japanese Market Brings Discussion of Webb-Pomerene Act and Export Situation

ALTHOUGH it is too early to predict what concrete action will be taken by industry following the discussion at the Department of Commerce of selling combinations, much interest is being manifested in the general question. Definite steps are expected shortly because of the need for prompt action if economies are to be effected in handling reconstruction sales in Japan. The time also is opportune to secure an amendment to the Webb-Pomerene act, if it should be found desirable to organize under that statute.

The agitation at this time of joint sales organizations or selling corporations composed of non-competing units is more than an effort to handle Japanese business in the most efficient way. It is being considered in connection with the movement to expand all American export activities. It is recognized that advantage must be taken of all possible economies if we are to compete in the world markets.

Joint sales organizations can be established by non-competing industries without legislation. There are some who believe, however, that advantages would accrue were it possible to organize non-competing activities into Webb law corporations. It is known that the Webb act is to be taken up for amendment at this session of Congress. The principal amendment which will be proposed is to permit of combinations for import purposes. These combinations doubtless will be limited to commodities produced entirely or in great part abroad in the handling of which artificial price levels are maintained.

The first definite step is likely to be taken by the manufacturers of construction materials. It is evident

that very important economies could be effected were sales of lumber, steel, sash, doors, plumbing, glass and paint and other building materials handled through the same agency. If organization along those lines expedites and makes more efficient the handling of the Japanese orders at this time, it is argued that it should be equally useful in handling other export business.

In the export trade American manufacturers are having to meet competition from countries where it is entirely legal to combine. The depression in Great Britain is forcing large-scale combinations, which mean reduced overhead charges and the elimination of the less efficient production units. One of the principal savings is in selling costs. Some middlemen are eliminated and distribution costs are reduced greatly. Knowledge and experience in manufacture can be pooled. Research can be undertaken on a more ambitious scale.

While American manufacturers may not take advantage generally of many of these economies by reason of our anti-trust statutes, some of them can be secured in the handling of exports. It is believed that Congress is disposed to consider sympathetically various amendments to the Webb-Pomerene act.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

THIS week sees the practical completion of the Christmas selling. It has been a bumper market generally throughout the country. Along the Eastern Coast and through the Middle West sales of holiday goods have reached a volume beyond any previous Christmas season in the history of the electrical industry's participation.

A conspicuous feature of the week in trade is the great volume of business being done in the New England States. Electrical supplies are moving at record-breaking rates with a very diversified demand. Lamp orders are taxing the factories nearly to the limit of normal output. Sales of motors have increased, prices of wire, flexible armored conductor and loom have gained especially, and prices generally are firm throughout this section of the country.

In the New York district business continues evenly. Ranges are selling stronger, also the larger appliances. Business is very good in the Southeast, where jobbers are low in stocks and construction is active, with a strong demand for materials both for house-wiring and for power-line extensions. The Middle West is experiencing a very heavy demand for radio equipment and heating appliances, but prices are unaltered on most commodities and the week has been rather quiet except for the Christmas selling. General business on the Coast has been entirely satisfactory, but without any spectacular developments.

Washington Actively Discussing Business Statistics Problem

IN VIEW of the consent decree formulated by the Department of Justice, in connection with the case against the Tile Manufacturers' Association, some thought has been given to action which would force a showdown in the whole matter of the legality of the collection of statistics by trade associations. The fear is that if that were done it inevitably would bring about a period of uncertainty, during which the whole statistical foundation of American business might be lost. The stability which has characterized business in this country for more than a year is attributed in some quarters to the better statistical information available. Business is depending more and more upon statistics. It is the one shield of the business world against booms and slumps.

Were the federal government to undertake the gathering of all statistics now collected by trade associations, it would involve a very large expenditure. The principal objection to it, however, would be the unavoidable delays in making the figures available. If the Department of Justice feels disposed to recommend to all trade associations the prescription which it forced upon the tile manufacturers, it might be necessary for the government to undertake the work. It is not thought probable that American industry would attempt to go forward with any statistical program of its own—bootlegging of statistics as some have suggested—in the face of Department of Justice disapproval.

There is some sentiment in favor of compulsory collection of basic statistics by the government, particularly in those industries where statistics are rendered almost valueless through the refusal of important units within the industry to submit figures. For instance, a large unit in the woolen industry refuses to contribute to the statistics of the trade. As a result, many of these statistics are valueless to manufacturers other than the one who holds out against them. He can add the published statistics to the figures which he withholds, and thus he alone is in a position to secure the benefit of the figures. This is so unfair to the other concerns engaged in woolen manufacture that it has stimulated the thought that the solution may be in collection of the statistics by the government under compulsory statutes. In that connection the suggestion has been made that the government should undertake the work when 60 per cent of those engaged in the trade should require it.

Lamp Sales Running Above Normal

UNPRECEDENTED demands for lamps characterize the rapid approach of the holiday season, and representative distributors and retailers report an exceptionally fine trade in fixtures, with increased activity in electric sign and billboard lighting. In the East the open season has permitted later motoring than was the case last year, and this has stimulated the demand for headlight lamps. An increase amounting to about 15 per cent in the price of miniature type C headlight lamps has been announced effective Jan. 1.

The sale of portable lamps is very active, and the demand for round-bulb lamps for use in bracket and other fixture lighting in homes has risen to such totals that factory stocks cannot be built up to any extent, even though high-pressure production is resorted to. Twenty thousand of these lamps are being turned out daily in a single New England factory.

A leading distributor of fixtures informed a representative of the ELECTRICAL WORLD on Monday that the public is steadily growing in appreciation of higher-quality fixtures in its purchases. The demand for kitchen-lighting units has stimulated sales of 100-watt gas-filled lamps in many parts of the country. In representative cases fixture sales are running 20 to 25 per cent above last year's figures, and this has its effect on lamp purchases as well as the increased consumption due to central-station development.

Japan's Increasing Importance as an Electrical Customer

JAPAN'S position as a purchaser of electrical machinery and the fundamental conditions of our expanding markets there certainly justify the expenditure of real sales effort on the part of American electrical interests, in the opinion of Walter Rastall, chief of the industrial machinery division of the Bureau of Foreign and Domestic Commerce. It is estimated by the bureau that more than 18,000,000 yen in electrical machinery, equipment and materials was destroyed during the recent earthquake. The bureau also estimates that an additional 4,000,000 yen in electrical appliances was lost.

Since 1915 there has been a marked expansion in the electrical machinery import trade of Japan and an especially gratifying increase in the volume of such imports from this country, and

conditions have now reached a point where the competition for this business lies between British and American manufacturers.

In the machinery industry as a whole the average American factory exports perhaps 20 per cent of its production, according to the bureau. The average English shop exports perhaps 60 per cent of its production, and the prosperity of these companies depends in greater or less degree upon this export ration.

New England Trade Mounts Higher in Volume

ELECTRICAL supplies are moving at record-breaking rates in the New England area. The demand is so diversified that the slump in cotton textile production has had little effect on the jobbers' total sales increase over last year. During the past fortnight wire, flexible armored conductor and loom orders have gained substantially; appliance sales are mounting to gratifying totals, and lamp orders are taxing the factories nearly to the limit of normal output. Sales of motors under 10 hp. rating have also quickened perceptibly this month. Non-metallic flexible conduit is in more diversified demand as regards regional distribution. Prices are firm, and miniature lamps for headlight service are scheduled for a general advance Jan. 1.

Building contracts in New England totaled $8,104,900 for the week ended Dec. 11, compared with $6,452,600 a year ago. Interest in street-lighting betterment is more active in many interior municipalities. Retail trade is brisker, and no shortage of commodities was threatened Monday, although there is some probability of being obliged to call upon factory stocks for the final rush just before Christmas, and there is every prospect of extremely low inventories in both manufacturers' and jobbers' hands at the turn of the year. Central-station business is increasing enormously. In some cases jobbing salesmen have been called off the road to help handle recent orders at the home office.

New York's Wiring Line Steady; Ranges and Cleaners Pick Up

NEW YORK'S electrical market continues at the even level held during the past two weeks, the wiring supplies market is bravely holding its own in face of heavy appliance buying in the retail market, and sales of conduit, rubber-covered wire, armored cable and lamps are said to be far above those of last year at this time. A general disposition among the jobbers is to mark time and wait until the holidays have passed again before concentrating too much on the building equipment market. Second-hand motors during the week received added attention, with some heavy purchases reported in the industrial districts to New Jersey.

Holiday buying is said to have exceeded that of any previous season in the history of the electrical industry. Sales are diversified, with very firm prices throughout the retail trade. A feature of the present appliance market is the noticeable increase in the intelligence of buyers in that they are well versed in the ultimate value of quality and are not merely seeking cheaper prices.

During the week range sales have increased in those sections where reduced cooking rates are in effect, in Westchester County and Connecticut. Sales of washers and cleaners also have picked up during the week, jobbers report, although there are some few reductions being made by the manufacturers at the first of the year.

Holiday Sales Records Broken in the South—Construction Active

ALL electrical retailers in the Southeast report that business so far is beyond expectations. Jobbers find themselves in many cases with stocks wiped out and all lines of heating devices and radio badly depleted. Dealers' stocks are so low that they are calling on the jobbers to fill orders for immediate delivery to ultimate consumers, in an effort to hold down pre-inventory stocks. Approximately $250,000 in Christmas savings accounts has been withdrawn from various Atlanta banks since the first of December and the holiday buying is now under full swing.

Sales of electrical constuction materials have fallen off slightly on account of inclement weather, but this lull is only temporary. Construction in the South in November, 1923, was almost 50 per cent in excess of the same month in 1922. Several of the larger central stations have under consideration and will undertake the construction of high-tension lines within the next thirty days. Much of this construction will be in south Georgia, which is practically virgin territory. This, of course, will stimulate the demand for materials going into the work.

A new ruling in Atlanta calls for the use of conduit or armored conductor from the eaves of the house to meter location and the installation of safety switches with meter trim on all wiring in that city. This ruling becomes effective Jan. 1, 1924.

Christmas Buying Continues to Take All Attention in Chicago

WITH the exception of holiday purchasing, the week of electrical trade for Chicago has been rather dull and uninteresting. But the Christmas trade is steadily reaching a volume which dealers say will far outreach that of any previous holiday season. The cold weather during the past few days has retarded building construction in some cases. Buildings now in the course of erection are being rushed to rapid completion before winter actually sets in. Prices remain the same on most commodities, the only exception being armored cable. This was reduced $1 per 1,000 ft., making the price $40 Pittsburgh on the No. 14 two-conductor size.

Sales of radio equipment and heating appliances of all kinds are increasing continually. The popular demand for radio is equal to that of two years ago. Jobbers are limiting their purchases even in holiday merchandise to quantities which they will be able to sell without carrying them over in their inventories.

Central-station purchases for construction work have been fairly good. Numerous orders for conduit, with deliveries specified the first of the year, have been booked by conduit manufacturers. While there is a feeling that conduit is likely to advance, nothing definite has been announced to date.

Season Successful on the Coast; Building and Railroad Markets Strong

BAD weather has interfered with the holiday season in some sections of the Far West, and there is fear that some dealers will be left overloaded with stocks after Christmas. On the whole, however, the market has been exceedingly good and the season a wholly successful one. The demand for heating devices, for instance, has been better distributed throughout the Coast than ever before. Vacuum cleaners have been selling exceptionally well and have apparently firmly established themselves as holiday merchandise

There has been no marked trend in general prices or stock conditions. Building continues good except in the San Joaquin Valley, where low grape prices and mildew have cut business to about one-third of its normal volume. Recent rains came in the nick of time along the Coast to save pasturage and the winter grain crop.

Bare copper wire has receded slightly, and other commodities are firmer than they have been since the temporary equilibrium in June. Railroad buying is exceedingly good in such lines as bare iron wire, strand and telephone cable. The Pacific Fruit Express announces that it has purchased more than 3,000 new fruit cars, valued at $10,000,000, for delivery before the peak of the 1924 season, and is enlarging its icing and yardage facilities. These are optimistic forecasts for the 1921 crop, and therefore for prosperity on the Pacific Coast.

The Metal Market

METALS during the week were very quiet, but, contrary to usual experience during a dull period, copper prices have held firmly at 13.50 cents, delivered. This strength of prices has been due to the surprisingly good statistics shown for November, which revealed a decrease in surplus of 10,000,000 lb., and also to the heavy sales in November, which put producers in a very comfortable position. Prices of finished products have been un-

changed for several weeks, although the American Brass Company last week increased extras for tinning sheet copper, making prices net list without discount because of the sharp advance in tin prices.

The surplus of refined copper is no more than 264,000,000 lb., which is little more than a month's consumption, based on November shipments. It seems very evident that prices will advance once a buying movement is resumed, and many are confident that the level will be established at 14 cents a pound early in January.

NEW YORK METAL MARKET PRICES

	Dec. 13, 1923 Cents per Pound	Dec. 20, 1923 Cents per Pound
Copper, electrolytic	13.25	13.50
Lead, Am. S. & R. price	7.00	7.00
Antimony	9.00	9.00
Nickel, ingot	27.00 to 30.00	27.00 to 30.00
Zinc, spot	6.35	6.35
Tin, Straits	45.00	45.00
Aluminum, 98 to 99 per cent	26.00 to 27.00	26.00 to 27.00

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Westinghouse's Growing Orders

The Westinghouse Electric & Manufacturing Company is experiencing a resumption of business activity, approaching spring and early summer levels, which is keeping plant operations at capacity. Unfilled orders now approximate $75,000,000. In the effort to reach a basis where it can promise earlier delivery on contracts and take care of more business offered, the company is striving to reduce unfilled orders. The Pittsburgh and Philadelphia plants are operating day and night.

The company's radio business has proved substantial, and activity in that field has reached record proportions. The company is pushing operations at the East Springfield plant in an effort to supply the growing shortage of radio sets. The outlook for business continues satisfactory, and the sales department announces that there is no indication of slackening of forward business. Bookings in November were larger than those in October, which in turn exceeded the September total of $10,600,000. Indications are that the total of the year will probably be as large as the $152,328,564 received last year.

Habirshaw Booked to Capacity Until March, 1924

The reorganization committee of the Habirshaw Electric Cable Company, whose initial plan for reorganization was set aside recently by federal court order, has prepared an amended plan which will soon be submitted to the court, according to testimony by counsel for the committee before Judge Knox last week. It was also brought out in the testimony that the Habirshaw company is booked to capacity until March 1, 1924.

Maxwell Brandene, counsel representing a small minority of the bond and claim holders, introduced a motion before the court for an order to permit creditors and bondholders to withdraw claims that they had deposited with the reorganization committee. Mr. Brandene suggested that he had a better and more conclusive plan for reorganization of the companies and intimated that many of the creditors whose claims were now filed with the reorganization committee would favor this new plan.

The counsel for the reorganization committee objected to any action before the introduction of an amended plan, which would be completed next week. Judge Knox reserved decision pending introduction of further evidence from both groups.

Elect Marathon Battery Officers

Walter H. Thorn was elected president of the recently organized Marathon Battery Company at Wausau, Wis., at the company's first meeting, held for the purpose of electing officers and discussing future operations. E. J. MacEachron, former mechanical engineer of the French Battery & Carbon Company, Madison, Wis., was elected to the post of vice-president and general manager. L. H. Wheeler will be secretary and Eugene Fuller, Madison, treasurer and sales manager. The company is capitalized at $150,000 and all of the stock has been reported sold.

Manufacturing operations will not begin at once owing to the fact that the company must have its equipment designed and made as there is no company putting out the special machinery necessary for this type of work. It is expected that the work of equipping the plant will be completed in about three months.

O. L. Perkins Joins Pettingell

Oscar L. Perkins, formerly associated with E. H. Carpenter in the Perkins-Carpenter Electric Supply Company, Boston, has joined the sales organization of the R. V. Pettingell Electric Supply Company, Boston, with headquarters at 51 High Street. He will devote his attention chiefly to central-station and mill trade. Wilbur Perkins, who was also employed by the Perkins-Carpenter Company, has entered the sales department of the Pettingell company. The Perkins-Carpenter organization has been dissolved.

E. H. Carpenter, formerly a member of the Perkins-Carpenter Electric Supply Company, Boston, has joined the sales staff of the Lewis Electrical Supply Company, Boston.

General Electric May Show $18 on Capital Stock

The General Electric Company is rounding out one of the most satisfactory years in its history, in which production has been at top speed and orders close to a record. On the basis of eleven months' operations, the net amount available for dividends should reach about $33,000,000, equal to $18 a share on the $180,000,000 outstanding capital stock. Earnings last year were $14.86 a share on $175,624,746 capital stock; in 1919 they were $20.80 on $120,000,000 stock, and in 1917, the record year, $26.50 on $101,500,000 stock. Inventory adjustment and depreciation charges at the close of the year will probably be about the same as in 1922.

Since the close of the company's fiscal year the company's capital stock has been swelled over $5,000,000 by distribution to employees of additional shares early in the year, while the new $10 par-value special stock has been increased to $17,000,000 by declaration in October of the second annual 5 per cent stock dividend. This stock is preferred as to dividends, and in the above computation the full year's dividends of 60 cents a share are taken on the $8,717,000 stock outstanding up to October. Aggregate dividend requirements for this year approximated $15,000,000.

Organize to Represent Makers of Power Plant Equipment

Announcement is made that Frank H. Schubert, district manager of the Wheeler Condenser & Engineering Company, and William G. Christy, secretary of the St. Louis Section, American Society of Mechanical Engineers, and formerly with the St. Louis Boat & Engineering Company, St. Louis, have organized the Schubert-Christy Construction & Machinery Company, with offices in the Railway Exchange Building, St. Louis. In addition to representing manufacturers of power-plant equipment, the company will render general construction engineering service, specializing in the design and construction of water-cooling equipment.

Apex Appliances Reduced

On Jan. 1, 1924, the price of the vacuum cleaner manufactured by the Apex Electrical Distributing Company, Cleveland, will be reduced to $47.50 from $57.50. In addition the company will make a new "trade-in" allowance of $10 for old vacuum cleaners. The

price of $10 for attachments will remain the same.

The "Rotarex" copper washer, which now sells for $167.50, will be reduced to $155, and the galvanized washer, which sells for $152.50, will be reduced to $137.50.

Electric Storage Battery Company to Have New Building in St. Louis

The Electric Storage Battery Company has recently purchased the property at 1026 South Vandeventer Avenue, St. Louis, and is erecting a building. The present location at Twenty-first and Walnut Streets will be given up when this builiing is completed. This company has outgrown its quarters, and the building now under construction will give it considerably more space. The plans are so arranged that additions may readily be made to the new building as the business grows.

The service station at 3408 Lindell Avenue will be retained, but all battery charging for the service station will be done at 1026 South Vandeventer Avenue. It is expected that the new building will be ready for occupancy by Feb. 1, 1924.

Just & Hanaman and Langmuir Patents Again Sustained

A decision was handed down this week in the United States District Court for the Southern District of New York in favor of the General Electric Company in a suit against P. R. Mallory & Company and a similar suit against Save Electric Corporation for infringement of the Just & Hanaman and Langmuir patents. Circuit Judge Julius M. Mayer sustained the validity of these patents for incandescent lamps, both tungsten and gas-filled, and found infringement by the defendants. These two cases were tried together in the spring of this year and were argued at the final hearing early in October. These patents have been sustained several times by the federal courts in prior suits.

Benjamin Announces Winners of Hallowe'en Window Contest

The Pacific Coast carried off first prize in the Hallowe'en two-way-plug prize-window contest which the Benjamin Electric Manufacturing Co., 847 West Jackson Boulevard, Chicago, put on toward the end of October, when the Stubbs Electric Company of Portland, Ore., won the first prize of $100.

The interest shown by jobbers and electrical dealers in co-operating with the manufacturers in obtaining material for window trims may be taken from the fact that more than 1,600 window trims were furnished. Both the second and third prizes went to Ohio jobbers—the Electric Sales Company of Columbus and the P. & A. Electric Supply Company at Mansfield, respectively. The fourth prize was awarded to the Seger Electric Company, Chicago.

Blaw-Knox Christmas Dividend

The Blaw-Knox Company, Farmers' Bank Building, Pittsburgh, manufacturer of transmission towers, has declared an extra Christmas dividend of 2 per cent on its common stock, payable Dec. 24, to stockholders of record Dec. 14. This will make a total dividend disbursement on this stock for this year of 10 per cent. President A. C. Lehman reports that earnings for 1923 will be equal to about 28 per cent on the common stock after allowance for depreciation and taxes and the payment of the dividends on the preferred stock, of which a 7 per cent cumulative issue of $1,400,000 is outstanding at present.

The outstanding common stock amounts to $3,750,000 (150,000 shares of a par value of $25). Indicated net earnings after taxes, depreciation and preferred dividend requirements for the year therefore are $1,050,000, or $7 per share, which would meet the stock dividend, at the recent regular rate of 8 per cent, for three and one-half years.

L. R. Brown Made Manager of G. E. Transformer Sales

L. R. Brown has been appointed manager of the transformer division of the new central-station department of the General Electric Company, according to a recent announcement. He was one of the company's first transformer specialists and has a wide personal acquaintance in the central-station industry.

Mr. Brown is a graduate of the University of Wisconsin, class of 1903. Following early work with the Oshkosk Electric Light & Power Company he entered the General Electric test course at Schenectady. He later took up duties in the switchboard department there, working on station layout engineering. With the establishment of the transformer sales department in 1906 he joined this division and in 1911 he was made head of the distribution section of transformer sales. In 1913 he established the first transformer commercial offices at Pittsfield.

In connection with the reorganization following this and other changes in the central-station department G. G. Jeter, H. F. McRell and Clinton Jones are to be sales managers in this division. Mr. Jeter will have charge of transformer accessories, advertising and publicity; Mr. Jones will have supervision of power transformers, and Mr. McRell of distribution transformers.

The Hoppes Water Wheel Company, Springfield, Ohio, has been organized to take over the plant and business of the Trump Manufacturing Company, manufacturer of waterwheels. The company will manufacture, in addition to waterwheels, a new hydro-electric unit designed by John J. Hoppes for use by small stream owners and for auxiliary light and power in large plants. Capt. John Lund, Washington, is financially interested in the new company, which will be headed by John J. Hoppes as president; Captain Lund, vice-president and general manager, and R. P. Henderson, chief engineer.

The Atlanta Electrical Association has appointed a committee of engineers, contractors and central-station representatives to co-operate with the Superintendent of Electrical Affairs in the revision of the Atlanta electrical code to conform with the new National Electric Code. This revised code will doubtless be adopted about Jan. 1.

The Boyer Manufacturing Company, Military Avenue, Detroit, has been organized with $50,000 capital stock to manufacture electric appliances, specializing in an electric motor-driven brush vacuum cleaner. The company has factory and equipment and is already producing. S. J. Boyer is president of the firm.

The Empire Miniature Lamp Corporation, 20 Clinton Street, Newark, N. J., recently organized with $50,000 capital stock, will manufacture electric lamps and kindred products. It has taken over the business formerly operated as the Empire Glass Bulb Company.

The Sanitat Manufacturing Company, Newark, N. J., recently organized with a capital of $250,000, to manufacture electrical appliances and equipment, has leased space in the building at 22 Green Street and will equip for its initial plant. The company has its registered office at 78 Clinton Street and is headed by Max Tischler.

The Litlude Battery Company, Morgantown, W. Va., will commence the construction of a one-story building at Connellsville, Pa., to cost $20,000 with machinery.

The Standard Electric Novelty Company, 324 Lafayette Street, New York, electrical specialties, has leased four floors in the building at 19 Bond Street for a new local plant and will take possession at an early date.

The Standard Electric Stove Company, Toledo, Ohio, manufacturer of electric fireless cookers, will move its manufacturing plant to combine with that of the Engman Matthews Range Company at Goshen, Ind., in the near future. Electric, wood, coal and oil stoves will be manufactured by the merged concern.

Paul A. Douden, formerly of the sales staff of the Western Electric Company in Denver, has organized a manufacturers' agency in that city under the name of the Globe Electric Supply Company, with headquarters at 1620 Wazee Street. Accounts already scheduled by the new firm are those of the Federal Electric Company, Redtop Electric Company, Strait & Richards, Walker-Pratt Manufacturing Company, Standard Electric Stove Company, Betts & Betts and the Joslyn Manufacturing & Supply Company of Chicago. Complete stocks of the last named company will be warehoused in Denver and Salt Lake City. The Douden organization plans to cover all of Colorado, Utah, Wyoming and New Mexico.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Port Said, Egypt (No. 8,536), of electric bulbs, wire, cords, small table lamps, wall fixtures and sockets and appurtenances.

An agency is desired in Upper Hut, New Zealand (No. 8,509), for electrical appliances.

Purchase and agency is desired in Christiania Norway (No. 8,552), for electrical equipment and appliances.

Purchase is desired in Havana, Cuba (No. 8,503), of storage-battery parts.

Purchase and agency is desired in Vienna, Austria (No. 8,514), for electrolytic copper in "wire bars" and "rolling cakes."

TENDERS ASKED FOR McLAREN FALLS (NEW ZEALAND) POWER SCHEME.—Tenders are being asked by the Town Council of Tauramga, New Zealand, until Feb. 19, for Sections 15, 16, 17, and 18, in connection with the McLaren Falls development scheme.

The following inquiries have been received by the Philadelphia Commercial Museum, which will furnish names and addresses of inquirers to any desiring them and mentioning the number given: Parties in Gorakund-Indore, India (No. 41,485), would like to get in touch with manufacturers of electric lamps, etc. A party in Havana, Cuba (No. 41,506), would like to communicate with manufacturers who desire to introduce radio apparatus in Cuba. Parties in Foochow, China (No. 41,541), would like to correspond with manufacturers of electric batteries, electric motors, marine engines, telephone and telegraph materials, etc.

ELECTRIC POWER PLANT CONTEMPLATED FOR ARGENTINA OIL FIELDS.—The Argentine State Oil Fields Administration, Buenos Aires, Argentina, it is reported, will receive tenders until Feb. 14, 1924, for the construction and equipment of a 11,250-kw. electric power plant.

New Apparatus and Publications

AUXILIARY RELAY.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a long-time-limit auxiliary relay, known as type "GK."

TEMPERATURE CONTROLLER.—The Foxboro Company, Inc., Foxboro, Mass., is distributing a folder describing the "Foxboro" temperature recorder-controller.

ELECTRIC COOKER.—The Durham Manufacturing Company, Muncie, Ind., has added an electric cooker to its line of fireless cookers.

DUPLEX BRACKETS.—A series of duplex brackets for carrying duplex street-lighting cable down the pole has been brought out by the Line Material Company, South Milwaukee, Wis.

ELECTRIC IRONER.—An open-end electric ironer, "Bilt Rite", with a roll 43 in. long, has been brought out by the Russ Manufacturing Company, West Fifty-eighth and Walworth Avenues, Cleveland.

ELECTRIC HEATER.—Electrahot Appliances, Inc., 301 Fifth Avenue, South Minneapolis, Minn., has placed a glow heater on the market.

GRIDDLE AND PLATE WARMER.—A new "Universal" pancake griddle, which can also be used to fry eggs, bacon, etc., has been brought out by Landers, Frary & Clark, New Britain, Conn. The company has also placed on the market a plate warmer for use in homes and restaurants.

GROUND CLAMP.—A ground clamp made of aluminum is being manufactured by the Gillette-Vibber Company, New London, Conn.

LAMP BRACKETS FOR TROLLEY POLES.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has designed a lamp bracket to be attached to a steel trolley pole, known as the "Columbia Trolleylite" bracket.

LAMP MAINTENANCE HANGERS.—The Thompson Electric Company, 226 St. Clair Avenue, N. E., Cleveland, is distributing a supplement to catalog B-21, covering "Thompson" lamp maintenance hangers.

DIRECTION SIGNAL.—An illuminated direction signal, "Wig-Wag," has been developed by the Kay Bee Manufacturing Company, 3508 South Park Avenue, Los Angeles.

TERMINAL FOR RESISTOR UNITS.—A new terminal support for resistor units has been developed by the Ward Leonard Electric Company, Mount Vernon, N. Y.

New Corporations

THE TRI-CITIES POWER COMPANY, Bolivar, Mo., has been incorporated by J. F. Bryant, J. B. Stewart and others. The company is capitalized at $150,000.

THE COLUMBUS DEVELOPMENT & POWER COMPANY, San Antonio, Tex., has been incorporated by Dr. W. S. McDaniel, O. A. Zumwalt and others. The company is capitalized at $100,000 and proposes to build a large power plant.

THE LINNVILLE CREEK LIGHT & POWER COMPANY, Edom, Va., has been chartered with a capital stock of $9,000. The officers are: A. S. Armentrout, Linville, president, and David Wenger, Edom, secretary.

THE AMERICAN SUPERPOWER CORPORATION, Indianapolis, Ind., has been incorporated with a capital stock of $5,000 to operate electric power stations, transmission systems, etc.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

MILLINOCKET, ME. — The East Millinocket Light Company has purchased the property of the Millinocket Light Company and plans extensions and improvements.

BOSTON, MASS.—The Edison Electric Illuminating Company has completed plans for an addition to its substation at 1207 Commonwealth Avenue.

LOWELL, MASS.—The installation of an ornamental lighting system in Merrimack Street from Cabot to Pawtucket Street is under consideration by the Public Service Board.

EAST HARTFORD, CONN.—The New York, New Haven & Hartford Railroad Company, New Haven, plans to build a power house at its local yards, to cost about $50,000, including an oil-storage building.

TORRINGTON, CONN.—Plans are being prepared by the Torrington Electric Light Company for the construction of a dam.

Middle Atlantic States

ADAMS BASIN, N. Y. — The Adams Basin Electric Light & Power Company plans to extend its electric system into the town of Parma and erect a distributing system along the Pine Hill Road to Parma to serve the residents in that section.

ALBANY, N. Y.—Bids, it is understood, will soon be asked for paving, laying sidewalks, curbing and lighting Madison Avenue (a distance of 2.9 miles), to cost about $300,000. J. G. Brennan, City Hall, is engineer.

BEACON, N. Y.—The Verplanck Brick Company plans to install electric power equipment in connection with plant extensions.

COHOES, N. Y. — The Mohawk Paper Makers, Inc., contemplates building a power plant to cost about $100,000.

NEW YORK, N. Y.—Plans for the proposed motion-picture plant to be erected by the Distinctive Pictures Corporation, 366 Madison Avenue, in Queens Borough, to cost about $300,000, include a power plant. William O. Hurst is architect.

POLAND, N. Y.—Permission has been granted to the Western New York Electric Company, Jamestown, to extend its electric system into Poland Township.

ROXBURY, N. Y.—The New York State Gas & Electric Corporation, Ithaca, has applied to the Public Service Commission for authority to serve electricity in the town of Roxbury under a franchise granted by the Town Board.

SYRACUSE, N. Y.—The Board of Trustees, St. Joseph's Hospital, contemplates the construction of a power house at a proposed institutional building on Prospect Avenue, to cost about $100,000.

HIGHTSTOWN, N. J.—Work has started on the construction of an electric power plant at the Peddie Institute, in connection with additional buildings, to cost about $400,000.

NEWARK, N. J.—Bids will be received by the Board of Education, Department of Supplies, City Hall, until Dec. 27 for electrical supplies and other equipment for local schools.

CORRY, PA.—The Penn Public Service Corporation, Johnstown, has acquired the property of the Corry Electric Light Company and will consolidate with its system. Extensions in transmission lines are contemplated.

CRESSON, PA.—The Penn Cress Ice Cream Company contemplates the construction of an ice and refrigerating plant with power plant in connection with a new factory, to cost about $150,000.

ERIE, PA.—The Pennsylvania Railroad Company plans to install electric power equipment and other machinery in connection with proposed extensions at its local ore docks, to cost about $500,000.

JUNIATA, PA.—Officials of the Juniata Public Service Company are organizing two subsidiaries, to be known as the Mifflin and Berrysburg Electric Service companies, to erect transmission lines in Mifflin Township and Berrysburg Borough respectively.

PHILADELPHIA, PA.—Plans are being prepared by the Philadelphia Electric Company for a substation at 106-12 North Eleventh Street.

PHILADELPHIA, PA.—The Wilmington (Del.) Bleachery Company will build a power house at its proposed mill in the Holmesburg section, to cost about $130,000.

READING, PA.—The Metropolitan Edison Company contemplates extensions in transmission lines and additional generating plants involving an expenditure of about $20,000,000. The work includes two stations now in course of construction at Middletown, Pa., and Holland, N. J., respectively, to cost about $4,000,000 each.

SCRANTON, PA.—The Scranton Electric Company plans to install additional equipment at its power plant, including a turbo-generator and auxiliary apparatus.

TITUSVILLE, PA.—The Municipal Service Company, Philadelphia, has purchased the system of the Titusville Light & Power Company and contemplates extensions, including new equipment.

WILLIAMSBURG, PA. — The Williamsburg, Saltillo, Saxton and Three Springs power companies are being organized by F. E. Harshaw and C. A. McClure, to construct transmission lines and substations in the above-named districts. James C. Jones, Bullitt Building, Philadelphia, is representative.

WHITEFORD, MD.—The Stasco Milling Company, care of the Industrial Bureau, Board of Trade, Baltimore, plans to build a power house at its proposed local roofing slate plant, to cost about $250,000.

FAIRMONT, W. VA.—The Monongahela West Penn Public Service Company contemplates an issue of $1,000,000 in capital stock, the proceeds to be used for proposed improvements in the upper Monongahela Valley.

NARROWS, VA.—The Virginian Railway Company, Norfolk, plans to build an electric plant at Narrows in connection with the electrification of its system in this vicinity.

LOUISA, VA.—The Council is planning to rebuild the light and water plant, recently daamged by fire.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until Dec. 26 for 400 switches, 1,000 cords and 200 switchboard plugs. (Proposal C. P. 15264-1.)

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until Jan. 8 for wire and cable for Eastern and Western navy yards. (Schedule 1700 and 1701.)

WASHINGTON, D. C.—Bids will be received by the purchasing agent, Panama Canal, until Jan. 2 for electric motor, etc. (Circular 1580.)

North Central States

AKRON, OHIO.—Bids will be received at the office of the Board of County Commissioners, Akron, until Dec. 26 for the installation of an underground electric light and

power service to run from the present power plant at the Springfield Lake Sanatorium to the children's building now being erected on the same grounds. Good & Wagner, Akron, are architects.

ELYRIA, OHIO. — The Columbia-Elyria Power Company has engaged B. R. Shorover, Oliver Building, Pittsburgh, Pa., as engineer in connection with constructing a new power house to have a capacity of about 4,000 kw. The cost is estimated at about $250,000.

MIDDLETOWN, OHIO.—The W. B. Oglesby Paper Company will install electric power equipment at its proposed mill addition, to cost about $90,000.

PLATTSBURG, OHIO.—Plans have been completed for the construction of a municipal electric system in Plattsburg. Electricity for operating the system will be obtained from the Indiana, Columbus & Eastern Traction Company, Cincinnati. The village will erect a transmission line (about 3 miles) to connect with the lines of the company.

COVINGTON, KY.—An ordinance providing for the installation of fifty-four ornamental lamps on Scott has been adopted by the City Commissioners.

LOUISVILLE, KY.—The Highway Iron Products Company, Columbia Building, will install a substation and electric power equipment at its proposed plant at Magnolia and Seventeenth Streets, to cost about $100,000. Joseph & Joseph, Francis Building, are architects.

ANDERSON, IND.—The Board of Public Works is considering the installation of additional equipment at the municipal power plant, including a 5,000-kw. turbogenerator and auxiliary apparatus.

GOSHEN, IND. — Extensions and improvements to the municipal electric light plant, to cost about $50,000, are under consideration.

URBANA, ILL.—Bids, it is understood, will be asked early in February for the installation of an ornamental lighting system on South East Street, to cost about $60,000.

EAU CLAIRE, WIS. — The Wisconsin-Minnesota Light & Power Company contemplates the construction of a warehouse, and garage, to cost about $50,000.

FENNIMORE, WIS. — The Council has approved an expenditure of $2,430 for improvements to the street-lighting system during 1924. Provision has also been made in the 1924 budget for improvements to the municipal electric light and power system.

FOND DU LAC, WIS.—An appropriation of $22,000 in 1924 budget has been approved by the City Council to be used exclusively for extensions and improvements to the street-lighting system in the downtown and residential section of the city.

KEWAUNEE, WIS. — The Council has recommended in the 1924 budget an expenditure of $2,400 for extensions and improvements to the street-lighting system.

OCONTO, WIS.—Arrangements have been made by the Northeastern Power & Light Company for the right-of-way for its proposed transmission line to Manitowoc Rapids.

PORTAGE, WIS. — Bids will soon be asked for extensions to the waterworks, including a new pumping station, water purification plant, etc., to cost about $100,000. Pearse, Greeley & Hansen, 39 West Adams Street, Chicago, are engineers.

RICHLAND CENTER, WIS.—The City Council is considering securing electricity from the high-tension transmission line of the Wisconsin River Power Company, Madison.

SHEBOYGAN, WIS.—Details have been completed by the South and West Side Advancement Association for extensions of the ornamental street-lighting system on North Eighth Street, Indiana Avenue, and on Thirteenth Street, covering five blocks on each street.

WEST ALLIS, WIS.—The installation of ornamental lamps on Sixty-eighth Avenue, National Avenue and on Greenfield Avenue is under consideration by the City Council.

BRAINERD, MINN.—Plans for the proposed municipal power plant at the city pumping station have been temporarily abandoned.

WINTHROP, MINN. — Plans are being considered for improvements to the municipal electric plant, to cost about $100,000.

BEDFORD, IOWA.—The Council is considering the construction of an electric light plant, to cost $40,000, and a distribution system, to cost $25,000. The Prince-Nixon Engineering Company, Peters Trust Building, Omaha, Neb., is engineer.

CENTERVILLE, IOWA. — The Iowa Southern Utilities Company contemplates extending its transmission lines to Unionville and Udell.

DAVENPORT, IOWA.—The United Light & Railways Company is disposing of a bond issue of $1,000,000, part of the proceeds to be used for extensions.

DUBUQUE, IOWA.—The Globe Portland Cement Company, McKnight Building, Minneapolis, plans to build a power house at its local cement mill, to cost about $200,000. The Charles S. Pillsbury Company, 1200 Second Avenue, South, Minneapolis, is engineer.

LEEDS, IOWA.—Plans are under consideration by the Leeds Improvement Association for extensions and improvements in the municipal lighting system.

UDELL, IOWA.—The proposal to issue bonds for the installation of an electric lighting system in the town will be submitted to the voters at an election to be held Jan. 3. It is proposed to secure electricity from the Iowa Southern Utilities Company, Centerville.

UNIONVILLE, IOWA.—At an election to be held Jan. 3 the proposal to issue bonds for the installation of an electric lighting system in Unionville will be submitted to the voters. Electricity will be obtained from the Iowa Southern Utilities Company, Centerville.

WATERLOO, IOWA.—The Citizens' Gas & Electric Company contemplates building a power house on the East River in the near future near the dam recently completed.

FESTUS, MO.—The City Council is considering the installation of electrically operated pumps in connection with the proposed municipal waterworks and sewerage systems, for which $175,000 in bonds have been voted.

HANNIBAL, MO.—Bonds to the amount of $400,000 have been voted for improvements to waterworks, including pumps, motors, filtration plant, reservoir, etc. D. H. Maury, 304 South Dearborn Street, Chicago, is engineer.

ST. JOSEPH, MO.—The City Council is considering calling a special election in January to vote on the proposal to issue $500,000 in bonds for a municipal lighting system. W. K. Seitz is city engineer.

ST. LOUIS, MO.—An issue of $500,000 in bonds for a power plant and also an issue of $500,000 in bonds for street lamps have been approved by the Board of Public Service and the Citizens' Bond Issue Supervisory Commission.

MANDAN, N. D.—The Northern Pacific Railroad Company, St. Paul, contemplates building a power plant in Mandan.

ALMA, NEB.—New equipment, including an oil engine, will be installed at the municipal power plant.

BEEMER, NEB.—The Continental Gas & Electric Company, Omaha, has been granted permission to erect a transmission line to Beemer.

Southern States

SALISBURY, N. C.—The installation of an ornamental lighting system in the business district is under consideration by the Council.

THOMASVILLE, N. C.—The Council is considering the installation of an ornamental lighting system.

FLORENCE, S. C.—The City Council is considering the installation of electrically operated pumps in connection with the waterworks and sewerage systems, to cost about $350,000.

LAKELAND, FLA.—The Municipal Light & Power Department plans to install electric pumping machinery at the city waterworks, to cost about $150,000.

MARIANNA, FLA.—The construction of a municipal hydro-electric power plant on the Chipola River, to cost about $100,000, is under consideration.

MIAMI, FLA.—The Miami Electric Light & Power Company is reported to be considering doubling the output of its plant.

SANFORD, FLA.—The City Commissioners are considering calling an election to submit the proposal to issue $800,000 in bonds to establish electric, gas and water plants.

TAMPA, FLA. — Plans have been prepared by Lockwood, Green & Company, Healey Building, Atlanta, Ga., for a warehouse and mill building, including cold-storage plant, office, etc., to cost about $750,000, for the Swann Terminal Company, 314 Madison Street.

AUSTELL, GA. — The Austell Cabinet Company plans to build a power house at its proposed local plant, to cost about $100,000.

CHATTANOOGA, TENN.—The Tennessee Electric Power Company contemplates new developments during 1924 involving an expenditure of about $5,000,000. Work on the proposed hydro-electric plant on Ocoee River will start as soon as the Hales Bar steam plant and the Rock Island developments are completed. The Ocoee River plant will have a capacity of about 24,000 hp.

CUMBERLAND, TENN.—The Nashville, Chattanooga & St. Louis Railway Company, Nashville, plans to install electric equipment at its proposed local rock-crushing plant.

SHELBYVILLE, TENN. — The Public Light & Power Company plans extensions in its hydro-electric power plant, including the installation of new equipment.

GREENWOOD, MISS. — The installation of an ornamental lighting system to be maintained by underground wires, to cost about $30,000, is under consideration. W. H. Hawkins is city engineer.

HARRISON, ARK.—The Carroll County Utility Company, Eureka Springs, has acquired the property of the Harrison Electric Company. The new company plans to rebuild the local plant and to erect an ice and cold-storage plant, to cost about $100,000.

NEW ORLEANS, LA.—Petitions have been presented to the City Council for the installation of ornamental lighting systems on Magazine Street and Ursuline Avenue.

BRONTE, TEX.—C. C. Holder is reported to be considering installing an electric light plant here.

COLUMBUS, TEX.—The Columbus Development & Power Company, recently organized, has tentative plans for a hydro-electric power plant on the Colorado River, to cost about $200,000.

EI PASO, TEX.—Steps have been taken by property owners on Texas Street for the installation of an ornamental lighting system, to cost about $70,000.

FORT WORTH, TEX.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Jan. 8 for twenty-seven flood-lighting projectors for the local navy station, and also, twenty-seven for the San Diego, navy yard. (Schedule 1684.)

HOUSTON, TEX.—The Blodgett Development Company plans to install a lighting system on a tract of land now being developed. J. Stuart Boyles is engineer.

MARLIN, TEX.—The Community Power & Light Company has issued $1,718,000, in bonds, part of the proceeds to be used to acquire the properties of the Central Texas Ice, Light & Water Company and the Central Texas Ice & Light Company, and for extensions to the transmission lines in this section.

PORT ARTHUR, TEX.—The Port Arthur Ice & Refrigerating Company contemplates the construction of a new plant, to cost about $325,000. Stone & Webster, Inc., 147 Milk Street, Boston, is engineer.

Pacific and Mountain States

ABERDEEN, WASH. — Bonds to the amount of $2,000,000 have been voted for a municipal hydro-electric plant on the Wynooche River, to develop 25,000 hp.

BELLINGHAM, WASH. — The Puget Sound Power & Light Company is planning to erect a terminal station at Elk and Magnolia Street, to cost about $200,000.

TACOMA, WASH.—Plans are being arranged for the installation of an ornamental street-lighting system on North Nineteenth Street and on Junett Streets.

PORTLAND, ORE. — The Oregon Land Company has applied for permission to construct a hydro-electric power plant on Miller Creek.

PORTLAND, ORE.—J. R. Keep has been granted a permit to utilize water from Lost Creek for a power development. The project includes two conduits, one 7 miles long and the other 10 miles.

PRINEVILLE, ORE.—Work is under way on extensions to the Cove power plant, to cost about $90,000. The work includes a new power house with sufficient space to house the present unit of 400 kw., the new unit of 1,200 hp., and a third unit of 1,225 hp., to be installed at some future time and a new substation (outdoor type), to be equipped with three 400-kva., 2,300/22,000-volt transformers. Bert L. Sivyer is secretary and manager.

SALEM, ORE.—Plans are being prepared by the Lyons-California Glace Fruit Com-

pany for an ice-manufacturing and cold-storage plant, to cost about $450,000.

BAKERSFIELD, CAL.—Plans are being considered for the installation of an ornamental lighting system on Chester, Baker, Nineteenth and other streets, consisting of about 150 standards. W. D. Clarke is city engineer.

COLTON, CAL.—The Southern California Edison Company will build an addition to its local substation to cost about $250,000.

GRASS VALLEY, CAL.—Plans are under consideration for the installation of an improved street-lighting system.

HANFORD, CAL.—The Southern California Edison Company plans to construct a substation on Fifth Street, to cost about $25,000.

HERMOSA BEACH, CAL.—Plans for the proposed local mill to be built by the Golden State Silk Mill, Inc., to cost about $400,000, include a power house.

HUNTINGTON BEACH CAL.—The California-Pacific Textiles, Inc., care J. W. Purinton, engineer, San Fernando Building, Los Angeles, is having preliminary plans prepared for a factory building, storage building, boiler house, transformer station, etc., at Huntington Beach.

LONG BEACH, CAL. — The Southern California Edison Company has retained Stone & Webster, Inc., 147 Milk Street, Boston, to build a 60,000-kw. extension to its Long Beach steam plant.

LOS ANGELES, CAL.—The Pacific Electric Railway Company plans to build at once two additional power stations to cost about $245,000. One will be erected at Second and Toluca Streets and the other at North Long Beach.

MARYSVILLE, CAL. — Steps are being taken for the installation of an ornamental lighting system on D Street.

MARYSVILLE, CAL. — Plans are being prepared by the Yuba Development Company, Hobart Building, San Francisco, for the Narrows project on Yuba River, including a storage dam, a 1-700-ft. pressure tunnel, a 300-ft. steel penstock and power plant to develop 1,700 hp. The Constant Angle Arch Dam Company, Hobart Building, San Francisco, is engineer.

OAKLAND, CAL.—Steps have been taken by the Uptown Association for the installation of an ornamental lighting system on Broadway from Fourteenth to Twenty-fourth Street, to cost about $50,000.

SAN DIEGO, CAL.—Plans are being prepared for the installation of an ornamental lighting system on Seventh, Eighth, Tenth, Eleventh, B and other streets and on the La Jolla Boulevard, consisting of about 177 standards.

SAN DIEGO, CAL. — Preparations are being made by the San Diego Consolidated Gas & Electric Company for the erection of its transmission system into the Imperial Valley through Escondido and Rincon (to cost about $200,000) to connect with a 100-mile high-tension line which will be erected by the Southern Sierras Power Company, Riverside, between El Centro and Rincon.

SAN FRANCISCO, CAL. — Steps have been taken by the Divisadero Merchants' Association to secure a better lighting system on that thoroughfare.

WILLITS, CAL.—The Central Mendocino County Power Company has been granted permission to erect a transmission line from Willits to Potter Valley and from the Dutch Flat Dam to Willits, to cost about $70,000.

FRANKLIN, IDAHO. — The installation of a new street-lighting system is under consideration.

RICHMOND, UTAH.—The installation of a new street-lighting system is under consideration.

LEWISTON, MONT. — The Montana Power Company will install a local street-lighting system, to cost about $13,000.

Canada

GODHUE, QUE.—The St. Regis Paper Company of Canada, Ltd., Montreal, has awarded a general contract to the Canadian Comstock Company, Montreal, in connection with a local hydro-electric development, to cost about $100,000. The installation of waterwheels, generators, penstock, pumps and motors and erection of transmission line and electrical distributors are included in the contract.

QUEBEC, QUE. — Plans are being prepared by the Quebec Harbor Commission for the construction of a cold-storage plant on the waterfront with power plant, to cost about $600,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Nov. 27, 1923)

1,475,878. MULTIPLE WIRE CABLE FOR HIGH-FREQUENCY TELEPHONY AND TELEGRAPHY; L. Rellstab, Berlin-Nikolasse, Germany. App. filed March 6, 1923. Reducing induction between wires.

1,475,880. CONTROLLING AND REGULATING SYSTEM FOR DYNAMOS; W. J. Rickets, London, England. App. filed May 21, 1920. Variable-speed generator voltage controlled by thermionic tube.

1,475,885. FIXTURE DEVICE; D. A. Rose, Berkeley, Cal. App. filed March 4, 1922. Attaching chandelier to ordinary outlet.

1,475,894. BEARING HOUSING FOR ELECTRIC MOTORS; C. W. Starker, Pittsburgh, Pa. App. filed Oct. 13, 1917. For ball or roller bearings and reduction gearing.

1,475,900. PANEL CUT-OUT BLOCK; G. B. Thomas, Bridgeport, Conn. App. filed Nov. 29, 1921. Means for indicating the branch circuit connections.

1,475,918. GENERATOR; A. E. Bucnenberg, Toledo, Ohio. App. filed July 14, 1917. Automatic means for regulating output of automobile generator.

(Issued Dec. 4, 1923)

1,475,933. DERECTIFYING SYSTEM; L. W. Carroll, Riverside, Ill. App. filed Nov. 3, 1919. Obtaining 110 volts from 32-volt farm-lighting units.

1,475,937. PHONOGRAPH RECORD MATRIX AND METHOD AND APPARATUS FOR PRODUCING SAME; J. T. Daniels, Newark, N. J. App. filed Sept. 30, 1919. Refinements in electrolytic process.

1,475,942. ELECTRIC RESISTANCE ELEMENT; F. A. Fahrenwald, Cleveland Heights, Ohio. App. filed Feb. 6, 1922. Composed of iron, chromium and manganese.

1,475,946. SIGNAL; H. Hafer, St. Louis, Mo. App. filed March 14, 1921. Automobile rear direction signal.

1,475,951. ELECTROMAGNETIC CONTROL; B. W. Jones, Schenectady, N. Y. App. filed March 5, 1921. Starting arrangements for motors.

1,475,968. ALTERNATING-CURRENT LINE; R. Rüdenberg, Berlin-Grunewald, Germany. App. filed Dec. 2, 1920. Compensating charging current by choke coils.

1,475,970. CONTROL MEANS FOR ELECTRICALLY DRIVEN MECHANISM; L. J. Stephenson, Chicago, Ill. App. filed Feb. 20, 1920. Operating vehicles propelled by motors.

1,475,973. PROCESS OF ELECTRODEPOSITION; B. S. Summers, Port Huron, Mich. App. filed Dec. 9, 1922. Depositing a protecting coating of lead on iron.

1,475,987. SINGLE-TRANSMISSION TELEGRAPH SYSTEM; W. A. Cushing, Newburgh Heights, Ohio. App. filed Jan. 27, 1919. Arrangements for transmitting and receiving signals over same line.

1,475,995. CHEMICAL CONVERSION OF SUBSTANCES; L. Heis and H. Jezler, Zurich, Switzerland. App. filed March 21, 1923. By means of electric discharge.

1,475,997. NETWORK FOR NEUTRALIZING THE SUSCEPTANCE OF A LOADED LINE; R. S. Hoyt, Brooklyn, N. Y. App. filed July 9, 1919. Relates to telephone line.

1,476,003. RADIO-SIGNALING CALL SYSTEM; De L. K. Martin, Orange, N. J. App. filed Aug. 18, 1922. Central radio station with number of remote stations.

1,476,005. MOTOR; J. C. Osher, Anaheim, Cal. App. filed Aug. 28, 1919. Motor for operating dental tools, hair clippers, etc.

1,476,028. ELECTRICAL CONNECTOR FOR SPARK PLUGS; J. Berge and L. B. Berge, Flint, Mich. App. filed April 11, 1919.

1,476,048. GRID FOR PROTECTING RÖNTGEN IMAGES AGAINST SECONDARY RAYS; G. Bucky, Berlin, Germany. App. filed May 17, 1923.

1,476,052. OVERHEAD CATENARY SUSPENSION CONSTRUCTION FOR TRANSMITTING ELECTRICITY TO VEHICLES; J. I. Comly, Harrisburg, Pa. App. filed Oct. 7, 1916. For trackless trolleys.

1,476,059. METHOD OF ELECTRIC DRIVING; P. P. Deutschmann, Berlin-Charlottenburg, Germany. App. filed Nov. 23, 1920. Method of determining acceleration of alternating-current hoist motors.

1,476,073. ELECTRIC BED WARMER; H. Guggenbühl, Ruschlikon, Switzerland. App. filed Aug. 16, 1921.

1,476,080. ELECTRIC BOILER CONSTRUCTION; F. T. Kaelin, Montreal, Quebec, Canada. App. filed Jan. 3, 1922. Prevents electrolysis action on metal parts.

1,476,105. SUPPORTING BASE FOR CURRENT CONDUCTORS; A. Pritzker, Toronto, Ontario, Canada. App. filed April 4, 1922. Porcelain base for elements of heating appliance.

1,476,116. ELECTRICAL HEATING ON RESISTANCE UNIT; H. A. Thompson, Pittsburgh, Pa. App. filed Feb. 24, 1921. Wire embedded in pyrex glass.

1,476,129. ELECTRIC TOASTER; L. H. Wilkinson, Meriden, Conn. App. filed Feb. 1, 1923. Reversible slice holders.

1,476,156. RADIO-FREQUENCY DEVICE; H. P. Donle, Meriden, Conn. App. filed April 7, 1921. Electron tube.

1,476,166. AUTOMOBILE THEFT PREVENTER; H. R. Mitchell, Seattle, Wash. App. filed May 31, 1922. Electric locking device.

1,476,251. ELECTROLYTIC CELL; R. S. Handy, Kellogg, Idaho. App. filed Aug. 30, 1922. For precipitating gold, silver, etc.

1,476,261. SYNCHRONIZER FOR SECONDARY CLOCKS; P. Mansel, Berlin-Charlottenburg, Germany. App. filed Nov. 26, 1921. Method of resetting clocks that have stopped or are slow or fast.

1,476,284. METHOD OF ELECTROLYSIS; F. G. Clark, Toronto, Ontario, Canada. App. filed April 7, 1921. Generation of oxygen and hydrogen.

1,476,289. LIQUID LEVEL INDICATOR; T. M. Feder, New York, N. Y. App. filed Dec. 13, 1921. Resistance in meter circuit varied by float.

1,476,291. POWER TRANSMISSION AND CONTROL; E. M. Fraser, Yonkers, N. Y. App. filed Sept. 19, 1919. Engine-generator-motor equipment for automobiles.

1,476,301. SOUND-CUT-OFF DEVICE; T. F. Rose, Jr., Collingswood, N. J. App. filed March 17, 1921. Movable shutter over telephone transmitter.

1,476,303. ELECTROLYTIC APPARATUS; J. N. Smith, Toronto, Ontario, Canada. App. filed April 7, 1921. Producing oxygen and hydrogen electrolytically.

1,476,322. ELECTRIC STARTER FOR INTERNAL-COMBUSTION ENGINES; A. Barenyi, Berlin-Lichtenfelde, and P. Kaemmerer, Charlottenburg, Germany. App. filed Nov. 28, 1922. Motor-generator for starting and charging batteries.

1,476,324. DENTAL CASTING FLASK HEATER AND INSTRUMENT STERILIZER; J. E. Burns, Flushing, N. Y. App. filed Oct. 26, 1920.

1,476,335. ELECTRIC WATER HEATER; W. W. Hicks, San Francisco, and A. J. Kercher, Berkeley, Cal. App. filed July 17, 1922. Circulation type of water heater.

1,476,363. ELECTROMAGNETICALLY ACTUATED APPARATUS; M. Herklotz, Berlin, German. App. filed March 19, 1923. Auxiliary apparatus for Tirrill voltage regulator.

1,476,366. CALL-INDICATING SYSTEM; C. E. Lomax, Chicago, Ill. App. filed April 19, 1920. For telephone systems.

1,476,374. ELECTRODEPOSITION OF RUBBER COATINGS; S. E. Sheppard and L. W. Eberlin, Rochester, N. Y. App. filed March 3, 1922. On metallic surfaces.

1,476,376. ELECTRIC HEATER; J. L. Schroyer, Chicago, Ill. App. filed Feb. 28, 1922. Waffle iron.

1,476,394. ELECTRIC GENERATOR; C. W. Dake, Chicago, Ill. App. filed Aug. 20, 1919. Induction type.

1,476,409. TELEPHONE RECEIVER ATTACHMENT; J. Mirzejewski, Milwaukee, Wis. App. filed Oct. 12, 1922. Holder for telephone receiver.

1,476,412. MOTOR CONSTRUCTION; J. D. Nies, St. Charles, Ill. App. filed April 18, 1922. Assembly of rocker structure.

1,476,441. HEATING SYSTEM; J. A. Dion, Fort William, Ontario, Canada. App. filed March 5, 1921. Electric house-heating system.

1,476,458. POWER TRANSMISSION; H. J. Murray, New York, N. Y. App. filed July 11, 1916. Engine-generator-motor drive for transmitting power.

1,476,538. ELECTRICAL APPARATUS FOR CONTROLLING INDICATORS AT A DISTANCE; J. C. Needham, London, England. App. filed March 9, 1923. By Wheatstone-bridge system.

1,476,569. ELECTRIC MOTOR CONTROL SYSTEM; T. Zweigsbergk, London, England. App. filed Dec. 29, 1919. Starting resistance automatically cut out in succession when master switch is operated.

1,476,575. DYNAMO-ELECTRIC MACHINE; M. Arendt, New York, N. Y. App. filed June 1, 1920. Third-brush type.

1,476,586. ELECTRICAL PLUG AND SOCKET EXTENSION UNIT; G. H. Bowen, Boston, Mass. App. filed Jan. 30, 1920. Extension plug for attaching appliances to overhead fixtures.